SMART WEIGHING SOLUTIONS

5100
Digital Indicator
Reference Manual

For use with Software Versions 3.1 and above

5100-600-340

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SPECIAL NOTE
TRADE USE OF THE RINSTRUM 5100

This manual may occasionally make reference to Trade Use settings of the **5100**. Only properly marked Trade Certified versions of the **5100** can be used in "Legal for Trade" applications.

1. INTRODUCTION

The **5100** is a precision digital indicator using the latest Sigma-Delta A/D converter to ensure extremely fast and accurate weight readings.

The setup and calibration are digital, with a non-volatile security store for all setup parameters. There is an NVRAM store to ensure day to day operating settings (zero / tare / clock etc) are retained when power is removed. There is a built-in clock for date-stamping printed outputs.

The instrument has up to six internal trip points with status display on the front panel. Output drive of these setpoints is provided by the optional setpoint card or combo card.

Two optional expansion cards are available for the **5100**. The first is the Setpoint card, which provides four opto-isolated open-collector output drive transistors and four opto-isolated inputs. The second is the 'Combo' card which combines the analogue and setpoint functions to provide one opto-isolated input and two opto-isolated open-collector outputs, along with a -10 to 10 V or 4..20 mA analogue output.

The **5100** provides a number of software options which extend the functionality of the instrument.

The communications software option provides two serial outputs**.** These allow communication with external computers, PLCs, printers and remote displays. Serial 1 provides both RS232 and full duplex RS422/RS485 drivers whilst Serial 2 provides RS232 transmission only. An optional RS232 to Current Loop converter is also available which converts the RS232 output to a passive 20 mA current loop transmitter. An additional software option extends the network capability to include the MODBUS ASCII protocol.

There are two setpoint software options that extend the basic setpointing capabilities to allow complete multiple-product, multiple-feeder batching for 4 products or 20 products.

1.1. The Manuals

This Reference Manual is part of a set of manuals covering the setup and operation of the Rinstrum **5100**. The set includes an Operator's Manual, a Reference Manual, and various Communications Manuals.

The Operator's Manual is aimed at the operation of the **5100**, and covers the day to day operation of the unit. This includes details of the operation of the front panel and external key functions, as well as installation information.

The Reference Manual (this book) contains detailed information on the calibration and setup of the **5100**. This manual is intended for use by Scale Technicians who are installing the instrument.

The Communications Manuals contain details on the extended networking capabilities of the **5100**. These manuals are available on request in hardcopy or by email in Adobe Acrobat PDF format. All of our manuals are also available to download from www.rinstrum.com

2. SPECIFICATIONS

PERFORMANCE		
Display		Backlit LCD with 20mm, 6 digit primary display
Display resolution		Up to 100,000 divisions, minimum of 0.15 µV/division
Count-by		1, 2, 5, 10, 20, 50, 100 (Entered in Displayed Weight)
Operating modes		Single Range, Dual Interval and Dual Range
Zero cancellation		+ / - 2.0mV/V
Span adjustment		0.1mV/V to 3.0mV/V full scale
Stability/Drift		Zero: < 0.1uV/°C, Span < 10ppm/°C, Linearity < 20ppm, Noise < 0.05µV p-p
Operating Environment		Temperature -10 to +50°C, humidity < 90% non condensing
DIGITAL		
Setup and calibration.		Full digital with visual prompting in plain messages
Memory retention		Full non-volatile operation
Digital filter		Averaging from 1 to 200 consecutive readings
Zero range		Adjustable from 4% to 100% of full capacity
A/D CONVERTER		
Type		24 bit Sigma Delta
Resolution		8,388,608 internal counts.
A/D Sync Filter		Adjustable, 15 to 60 cycles /second, FIR filter > 80dB
LOAD CELLS		
Excitation		8 volts for up to 8 x 350 ohm load cells
Load cell connection		6 wire + shield
SERIAL COMMS		(Factory Software option)
Serial outputs		Dual RS-232, plus RS-422/RS-485
Capabilities		Automatic transmit, network, or printer drive
Clock		Battery backed clock & calendar fitted
DIMENSIONS		
Body size		135mm wide x 65 mm high x 105 mm deep
Front Bezel		179mm wide x 82mm high (Overhang is 20 mm on left and 23mm on right of Bezel)
Panel cutout		DIN 43 700 - 137(+1)mm wide x 68(+1)mm high
Power Supply	DC	12/24VDC 3-5VA
	AC	86 - 260VAC 48 - 62 Hz 3-5VA
OPTIONS		
Setpoint option card		4 x isolated 50volt, 500mA open collector transistor drives and 4 x isolated digital inputs (5V to 28V).
Combo option card		-10 to10 V or 4-20mA opto isolated analogue output, two outputs and one input as per the Setpoint option card.
No. of option slots		One standard. (12-24VDC units can be ordered with 2 slots)
FEATURES		
		NSC Approval S363. Ctick approved.
		Five point linearity correction
		Adjustable anti-vibration filter
		Comprehensive batching operation (requires setpoint accessory card, combo card, or PLC and Software Options). (PLC output module allows 6,14 or 22 relays)
		Modbus protocol support (software option)

3. INSTALLATION

The **5100** can be used as either a desk-top or panel-mount instrument. It contains precision electronics and must not be subject to shock, excessive vibration, or extremes of temperature, either before or after installation.

The inputs of the **5100** are protected against electrical interference, but excessive levels of electro-magnetic radiation may effect the accuracy and stability of the instrument. The **5100** should be installed away from any sources of electrical noise. The load cell cable is particularly sensitive to electrical noise, and should be located well away from any power or switching circuits. Termination of the load cell shield at the **5100** end is very important for EMC immunity. This should be done by wrapping the shield back along the cable and clamping it under the cable clamp of the backshell.

3.1. Panel Mounting

Panel mounting requires the optional mounting kit, consisting of a pair of clamp slides.

Remove the two 5mm screws attaching the side clamp slides to the rear of the case. Remove the slides to the rear. Fit the case into the panel from the front. Replace the slides into the slots. Replace the two 5mm clamp screws. Do not over-tighten the screws as this could damage the case.

An optional swivel mounting kit required for desk and wall mounting is also available.

3.2. DC Power Supply

The DC supply need not be regulated, provided that it is free of excessive electrical noise and sudden transients. The **5100** can be operated from a high quality plug-pack as long as there is sufficient capacity to drive both it and the load cells.

The **5100** complies with all the relevant EMC standards, and carries full CE approval provided that the case ground connection is correctly made. The case ground connection is available either on the power connection socket or a termination bolt nearby. The resistance measured between the case of the **5100** and the nearest earth point should be less than 2 ohms.

3.3. AC Power Supply

The AC power supply for the **5100** can operate over a wide range of AC voltages. This power supply automatically adjusts to the incoming voltage. This means that the **5100** is extremely tolerant of voltage dips and brown out conditions, especially when running off 220 or 240 VAC mains.

The **5100** uses a standard IEC power inlet.

3.4. Load Cell Signals and Scale Build

Very low output scale bases can be used with the **5100**, but may induce some instability in the weight readings when used with higher resolutions. Generally speaking, the higher the output, or the lower the number of divisions, the greater the display stability and accuracy.

The **5100** has a millivolt-per-volt meter test mode which can be used to check scale base signal output levels. Refer to Section 7.10 on page 37.

3.5. Load Cell Connection

Six Wire Connection

The connection is made using a standard DB9 male plug.

Pin	Function	Pin	Function
1	Positive Excitation	2*	Positive Excitation Sense
3	Negative Excitation	4*	Negative Excitation Sense
9	Positive Signal	8	Negative Signal

***Sense Lines MUST be connected**

When wiring load cells, use only high quality shielded multi-core cable. The cable should be run as far away from any other cabling as possible (minimum separation distance 150mm).

To obtain full EMC resistance with the 5100, the load cell shield MUST be connected electrically to the metal shell of the DB9 connector. The easiest way to connect the cable shield to the DB9 backshell is to fold the shield wire back over the outside of the cable insulation so the cable clamp of the backshell makes good electrical contact with the shield when installed.

Four Wire Connection

When a four wire load cell system is connected, pins 1 and 2, and pins 3 and 4 must be joined by solder bridge or wire bridge to ensure that the excitation voltages are fed into the sense inputs (pins 2 and 4). Failure to do this will result in the 5100 displaying an error message (E0040, E0080 or E00C0). The unit will not operate if the sense pins are not connected correctly.

3.6. Serial Ports

The Serial Ports are a factory fitted optional extra. The DB9 connectors are fitted on all units. If the serial option is not fitted on your unit, all menus dealing with serial setup are blocked with the “No Entry” message.

3.6.1. Serial 1 - Networking Port

All connections for this port are via the Serial 1 connector. This is a standard DB9 socket requiring a female DB9 plug. The RS232 and RS422/485 interfaces are connected in parallel within the **5100**, and both output exactly the same message. The connections for the outputs are shown below. Note that the **5100** only supports 4 wire full duplex RS422/485.

Pin	Function	Description	Connect To
2	RX1	RS232 Receive Line	External Device Transmitter (Usually pin 3)
3	TX1	RS232 Transmit Line	External Device Receiver (Usually Pin 2)
5	GND1	RS232 Digital Ground	External Device Digital Ground (Usually Pin 5)
6	RA	RS422/485 Receive A (-)	External Network
7	RB	RS422/485 Receive B (+)	External Network
8	TA	RS422/485 Transmit A (-)	External Network
9	TB	RS422/485 Transmit B (+)	External Network

Connect shield as directly as possible to the metal DB9 shell.

Multi-Drop Networking

The following table shows how to connect a number of instruments in an RS422/RS485 four wire multi-drop network:

Cable 1				Cable 2			
6700 or network master		5100 Unit 1 Serial 1		5100 Unit 1 Serial 2		5100 Unit 2 Serial 1	
F'n	Pin	F'n	Pin	F'n	Pin	F'n	Pin
RA(-)	6	TA(-)	8	RA(-)	6	RA(-)	6
RB(+)	7	TB(+)	9	RB(+)	7	RB(+)	7
TA(-)	8	RA(-)	6	TA(-)	8	TA(-)	8
TB(+)	9	RB(+)	7	TB(+)	9	TB(+)	9

For more than 2 units duplicate Cable 2 between each new unit and the network.

The end devices in a multi-drop RS422/485 network may need to be provided with termination resistors to balance the network loadings. These resistors are built into the **5100** and they can be enabled or disabled using the digital setup. Refer to Section 7.6 starting on page 28.

3.6.2. Serial 2 - Printer Port

All connections for this port are via the Serial 2 connector. This is a standard DB9 socket requiring a female DB9 plug. An RS232 interface is the only output from the Serial 2 connector. The connections for this are shown below.

Note that pins 6,7,8 and 9 of the serial 2 connector are connected directly to pins 6,7,8 and 9, respectively of the Serial 1 connector. This provides for convenient implementation of multi-drop RS422 or RS485 communications.

Pin No.	Function	Description	Connect To
3	TX2	Output Transmit Line	External Device Receiver (Usually Pin 3 on printer)
5	GND2	Digital Ground	External Device Digital Ground (Usually Pin 7 on printer)
4	DTR	DTR Handshake Line	External Device Busy Line (Usually Pin 20 on printer)
6	RA	RS422/485 Receive A (-)	External Network
7	RB	RS422/485 Receive B (+)	External Network
8	TA	RS422/485 Transmit A (-)	External Network
9	TB	RS422/485 Transmit B (+)	External Network

Connect shield directly to the metal DB9 back shell.

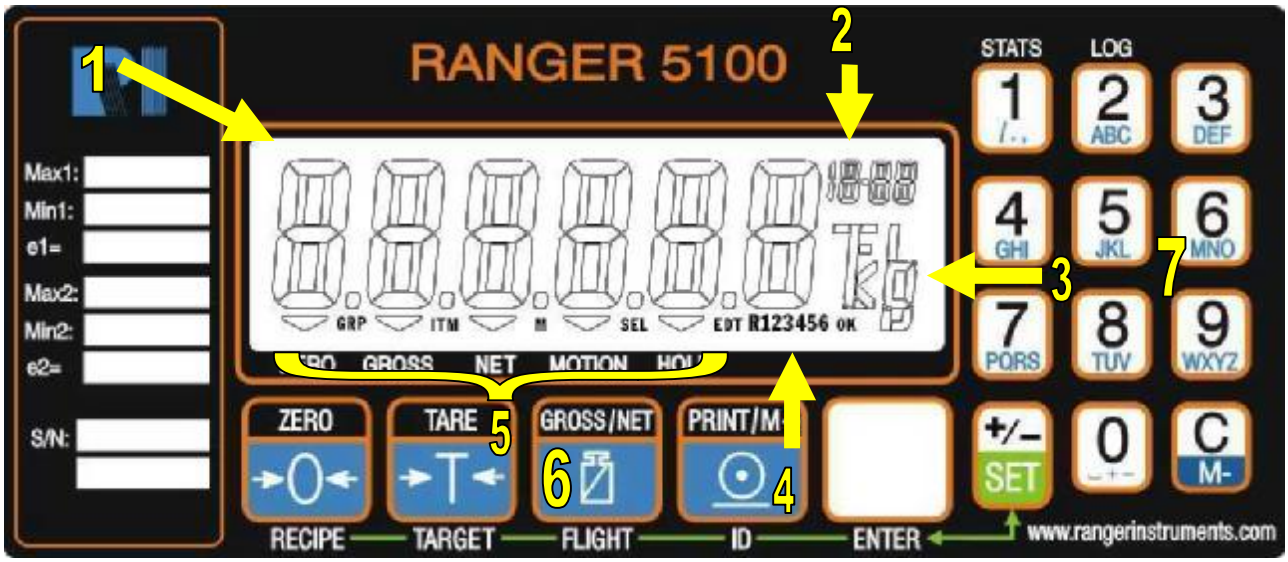
3.7. The Option Cards

Connection details for the optional output cards are provided in Section 12 (Page 69).

4. DISPLAY AND CONTROLS

4.1. Front Panel

The front panel of the **5100** has a six digit LCD display (1), and a full numeric 17 key keypad (7). The diagram below shows the main elements of the front panel.



4.2. Visual Display

The **5100** has five main display sections for the visual output of weight information, the Weight Display (1), the Auxiliary Display (2), the Unit Indicator (3), the Range/Output Display (4) and the Annunciators (5). Each section is described below.

Weight Display (1)

The Weight Display indicates the weight readings, setup information, errors and warnings.

Auxiliary Display (2)

This display provides additional information related to the task you are performing. For example, during batching, this shows the current recipe or percentage completed. It may also be configured to show other information when not in use (e.g. current time).

Unit Indicator (3)

The Unit Indicator displays the units of measure as either grams (g), kilograms (kg), pounds (lb) or tonnes (t). If the instrument is setup for counting the units of measure will show 'p' for pieces. The '%' symbol is displayed when percentage values are being entered during setup.

Range/Output Display (4)

When the indicator is in multirange mode, this shows the current range in use. If the indicator is in a single range mode, these show the output status of the first six setpoints.

Annunciators (5)

The annunciator bank made up of two groups. The status annunciators include 'M' and a number of small ▼ triangles( ) that show the status of the

displayed reading. The editing annunciators are used during menu operations to show the available buttons and the current menu level.

The status annunciators show the following:

ZERO	Lit when the displayed reading is within ± ¼ of a division of true zero.
GROSS	Lit when the display reading represents GROSS weight.
NET	Lit when the display reading represents NET weight.
M	Lit when there is a valid total weight stored in memory.
MOTION	Lit when the displayed reading is not stable.
HOLD	Lit when the display is frozen by a hold operation.

The editing annunciators show the following:

GRP	Lit when in the main GROUP menu.
ITM	Lit when in the ITEMS menus.
SEL	Lit when the GROSS/NET button is active for editing.
EDT	Lit when the PRINT button is active for editing.
OK	Lit when the FUNCTION button is active for editing.

4.3. Control Buttons (6) and (7)

The **5100** has two sets of buttons:

- The function keys (6)
- The keypad (7)

The function keys (6) consist of five buttons:

- Zero
- Tare
- Gross/Net
- Print
- User assignable button

The first four function keys are fixed to perform necessary weighing functions, while the last may be assigned by the user to perform a range of desired operations. These operations include peak hold, batch start/pause/abort. Each of the function keys have three separate functions:

- A Primary Function that is available during normal weighing - this function is printed in white at the top of the button.
- A Secondary Function is available during operator input of batching parameters like target weights. The secondary function is printed below each key.
- An Editing Function which is available during digital setup and calibration. This function is displayed using the editing annunciators above each button.

The keypad consists of 12 keys. These include the SET and CLEAR keys and the 10 digits. These keys provide a number of functions. Primarily they are used for numeric input. Other functions include entry of text and navigation of lists.

4.4. Data Entry Modes

Throughout the **5100** operator interface, a number of data entry methods are used. Each method, and its operation is described below.

Numeric Entry

A numeric entry box allows the input of a number. When entering a number the display will show the number as "000000", with the number of digits to be entered flashing. The keypad keys 0 to 9 enter a digit from the right, moving all existing digits left one place. The +/-/SET key can be used alternate the sign for signed numeric entries only. To delete a single digit, the C key can be used. Holding the C key for two seconds will cancel the entry. The OK key will accept the number that has been entered.

Upper and lower limits are placed on some entries and an entry outside this range will cause the **5100** to display "- - - - - -", and then revert to the previous correct value.

Basic Alpha-numeric Entry

A basic alpha-numeric entry allows the input of a string of up to six characters. The **5100** will display the six characters, with the active character flashing. "REC_12" is an example of this style of entry. Pressing the SEL key will advance to the next character. The EDT key will increment the current character. Use the keypad keys to enter a specific character. For example, to display "L", press the 5 key three times. There are upper case letters, digits and lower case letters available on each key.

At any time the OK key can be pressed to accept the string. Holding the C key for 2 seconds will cancel the string entry.

Advanced Alpha-numeric Entry

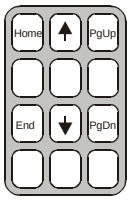
An advanced alpha-numeric entry allows the input of strings longer than six items and characters not available on the keypad keys. The **5100** will display the string in either of the following formats "1.01.065" or "1.01. A ". The first format is [L.PP.CHR], where L is the line number, PP is the position on the line, and CHR is the ASCII number of the character. The latter format is essentially the same as the first format, however CHR displays the actual character. The SET key will switch between the two formats. To enter a character in the first format, the keypad may be used to enter a number. In the second format, the keypad keys will enter the letter/number displayed on the key, in the same fashion as the Basic Alpha-numeric Entry.

The SEL key will advance to the next position, whilst the EDT key will increment the current character. The OK key will accept the character and move to the next one. Press and hold the C key for 2 seconds to cancel the entry of a particular character.

Selections

A selection entry requires the choice of a single item from a list of options. The currently selected item is displayed, and EDT key can be used to switch between the available options. A single press of the C key will switch between items in the reverse order.

Due to the large number of options available within some selection entries, the keypad provides an alternate method to navigate the entries. Similar to a standard computer keyboard, the following keys have been assigned the following functions:

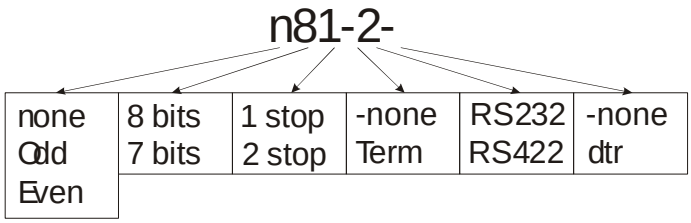


Key	Function
Home/End	First/last item in list
↑/↓	Up/down one item in list
PgUp/PgDn	Up/down five items in list

Pressing the OK key will select the current item, whilst the C key held for two seconds will abort the selection, and revert to the original item.

Options

An option entry allows the selection of an option for a number of settings. Typically these items are on/off items, however more than two options are available in some cases. For example, the **5100** serial settings are configured via an option entry, as shown below. The currently selected item will flash, and may be changed by using the SEL key. Press the EDT key to advance through the available options. The C key will return an option to its original state.



Pressing the OK key will accept the current settings for all options shown. Holding the C key for two seconds will escape from the option entry and cancel all changes to the options.

5. Basic Operation

In its most basic configuration, the **5100** provides a simple weight readout with optional printing and serial output capability. More advanced configurations allow for batch control and setpoints, as detailed in Section 10 (Page 52).

5.1. Basic Terminology

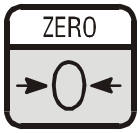
Setpoints are outputs that are activated when certain conditions are met. They can be weight dependent, such as a material setpoint and an active setpoint. Other types control sequences, such as a dump setpoint, whilst others provide status outputs, such as a zero setpoint.

Recipes use the defined setpoints and store quantities for weight dependant setpoints (active and material setpoints). These quantities include targets, inflight settings, preliminary targets and tolerances.

5.2. Using the Primary Key Functions

A single press of each key triggers the weighing operation printed on it. The **5100** allows individual buttons to be disabled in the setup. All buttons are enabled at the factory, but some buttons may have been intentionally disabled during installation. If a button has been locked a long beep sounds when it is pressed. If however, the button beeps normally, but does not appear to trigger the desired action it is probably waiting for the weight reading to settle before the action can proceed. If the action is blocked for more than 10 seconds due to motion, the action is canceled and a warning message is displayed.

ZERO Button



GRP

This button is used to perform a zero adjustment on the scale display if the empty scale has drifted away from a true zero reading. The zero adjustment is stored by the **5100** when power is removed, and is re-used when next powered up.

The amount of weight that may be cancelled by the zero button is limited via an item in the digital setup of the unit.

TARE Button

ITM

This button is used to temporarily set the scale to zero (such as canceling the weight of a carton before performing a filling operation). The display will show NET weight and the NET annunciator will be lit.

The TARE button can operate over the entire valid range of the display. In Trade Mode the Tare button will not operate if the displayed gross weight is less than or equal to zero. Negative tare is permitted in Industrial Mode.

The weight tared is deducted from the allowable range of the scale, reducing the maximum weight that can be displayed.

Numeric TARE Entry

To enter a Tare weight directly, simply enter the weight value using the numeric keys and press the Tare button. The display will flash while the tare weight is being edited, and then show the preset tare value with the auxiliary display showing 'PT'.

It is also possible to enter multiple Tare values by pressing and holding the Tare button for 2 seconds after entering the tare value. In this way it is possible to add numerous values to the preset tare.

To clear a preset tare either return the display to gross mode via the gross/net button, or enter a zero value for the preset tare.

GROSS/NET Button

SEL

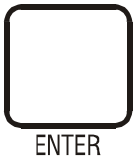
This button toggles the weight display between the Gross weight and the Net weight (provided that a Tare has previously been acquired using the Tare button).

PRINT Button

EDT

If a printer or computer has been attached to the **5100** and the manual print function selected, the Print button will trigger an output of the current weight reading.

FUNCTION Button



OK

The Function key ships standard without any primary function as a blank white key. The primary role of this key can be selected from a number of different functions including peak-hold, counting, batching, etc. See Section 11 (Page 66) for full details of the available functions. Each primary function has an associated overlay sticker that should be applied to the function key to label its function.

Stability Considerations

Once a Zero, Tare or Print button is pressed the unit waits for a stable valid reading before performing the associated operation. If the weight readings remain unstable or invalid due to some Diagnostic Error for longer than 15 seconds the operation is canceled and an error message is displayed.

To improve the stability of the weight reading, increase the filtering or relax the motion detection criteria. Refer to Section 7.3 on page 23.

It is also possible in non-trade applications to set the buttons to act immediately regardless of the stability of the weight reading. See Section 7.5 (Page 26).

5.3. Using the Operator Interface

In addition to the primary functions of the five operator keys, a secondary set of functions are available for the entry of operating information for the **5100**.

The SET key has dual functions. For numeric entries, the SET key acts as a sign key. The primary function of the SET key, however is to access and exit the Operator Menus. An Operator Menu heading is printed below each of the primary function keys. Whenever the SET key is pressed, 'SET' is displayed on the auxiliary display, and the Operator Menus become available. To access a particular Operator menu, press the appropriate key. Pressing 'SET' at any stage will return the **5100** to normal operation.

To navigate around the Operator Menus, the menu keys will switch to each of the operator menus. Repeatedly pressing an Operator Menu key will advance through the items associated with that Operator menu. The items in each Operator menu are explained in the subsections below. The menu keys can be pressed in any order to select the item of interest. To leave the operator menus press the SET key again.

Whilst the Operator Menus are active, the auxiliary display is used to identify each of the menu items. For example, 'TGT' is displayed to indicate that a particular item is a material target weight. To change any item, simply enter a new value as per the entry types described in Section 4.4 (Page 11).

Access to the Operator settings can be restricted by setting an operator passcode and an access level setting. See Section 7.5 (Page 26) for information on Operator passcodes and security.

RECIPE Settings

The following items are available from the operator menu labeled RECIPE. They can be accessed by pressing the SET key followed by the RECIPE key. Pressing the RECIPE key will advance through the available items.

FIND: The FIND option allows an operator to locate a particular recipe by searching for its' ID name. Each RECIPE has a number and is also identified by a 6 character alphanumeric ID. To search for a recipe press the first letter of its ID at the FIND prompt. Each subsequent press of an alphanumeric key will list the recipes with IDs starting with that letter or number. To step through all of the recipes with IDs that share a particular letter press the SEL key. The recipe ID is shown on the main display and the recipe number is shown on the auxiliary display. If there are no recipes with IDs starting with the letter chosen, then the letter will be shown followed by dashes (eg A----- would be shown if there were no recipe IDs starting with 'A').

PROP: The PROPortion option allows the quantities of all ingredients within the particular recipe to be scaled by the percentage entered. Legitimate recipe proportions range from 1.0% to 1000.0%. For example, a proportion of 200% would double the weight of each ingredient, thereby doubling the weight of the batch.

TARE: To enter a Preset Tare value for the current recipe enter the tare weight and press OK. Use recipe tares when topping up known containers that are partially full.

TARGET SETTINGS

The target menu allows material targets to be set for the current recipe. Press the SET key followed by the TARGET key to access the target menu. Pressing the target key will then step through all of the material targets for the current recipe. The material name is shown followed by the target weight. 'TGT' is shown on the auxiliary display.

FLIGHT SETTINGS

Flight settings associated with each material are available from this menu. The material name is shown followed by the particular flight setting. The auxiliary display shows which flight setting has been selected. To change a setting, type in the new weight using the numeric keys and press OK. Press the FLIGHT menu key to cycle through flight settings for a particular material. Use the TARGET menu to select the materials.

Available settings are:

- PRE: Preliminary target value for the material.
- FLT: In-flight weight setting.
- TOL: Tolerance weight setting.

ID SETTINGS

The following items are available from the ID operator menu. They can be accessed by pressing the SET key followed by the ID menu key. Pressing the ID key will advance through the available items.

ID: Each recipe can be given a six character identification. This ID is used to find a required recipe, and may also be printed. The ID for a current recipe can be entered from this menu. The recipe ID may by restricted to numbers only or it may use letters as well, depending on the setup configuration. See Section 7.5 (Page 26) for information on the different recipe ID types. On entering the menu, 'REC.Id' is shown on the main display followed by the recipe identification string. The current recipe number is shown on the auxiliary display.

REF: In addition to the sequential printout ID that is used to uniquely identify each printout it is possible to enter a 6 digit Reference Number that can be shown on the printed ticket.

HEADER: The dual line twenty character print header can be configured from the ID menu. This is not stored as part of the recipe information, but this option provides a convenient way for the operator to alter the printed ticket information without having to enter the setup menus. Refer to Section 7.6 starting on page 28 for information on the printer ticket header.

Shortcuts

A number of shortcut sequences exist to allow the operator to set the current recipe or Printer Reference directly. These shortcut sequences operate in exactly the same way as for setting a numeric tare. To use a shortcut, enter a number using the numeric keys and then press the Recipe, Tare or ID buttons. This will set the current recipe, numeric tare or printer reference to the number entered.

6. APPLICATION CONFIGURATION ISSUES

6.1. General Setup Information

The **5100** configuration and calibration can be performed entirely from front panel, using the Digital Setup facility. To protect the scale calibration, two modes of setup are available. Full setup is provided for calibration and initial configuration of the **5100**. When Full Setup is used, all menu items are accessible, and care must be taken to ensure no accidental changes are made to calibration and trade settings. Safe Setup is similar to the Full Setup, except all critical steps controlling the calibration and trade operation of the **5100** cannot be accessed. Safe setup only permits access to those digital functions that will not effect a trade scale's certification.

Both Safe and Full setup can be passcode protected with separate passcodes to prevent unauthorised tampering, as detailed in Section 7.5 (Page 26). If the scale has been passcode protected, the setup menus cannot be accessed until the correct code has been entered.

Terminology

A knowledge of the basic weighing terms is useful in setting up and calibrating the **5100**. The terms used include "Units", "Range", "Count-by" and "Graduations". These terms are used throughout the setting procedure and are defined as follows:

Units describes the actual units of displayed measurement (kilograms, tonnes, pounds, etc)

Range describes the total change in weight between zero gross load and full capacity gross load. It is always given in displayed weight units. This is the nominated total capacity of the scale.

Count-by (E1 or E2) describes the smallest change in weight units that the display can show.

Graduations describes the maximum number of display steps between zero gross load and full capacity gross load. It is equal to the Range divided by the count-by.

The following example demonstrates the use of these terms:

A 10,000kg 2.0mV/V load cell is used in an application requiring a 5000kg range, with weight displayed in 5kg increments. The values of each of the above terms are as follows:

$$\text{Units} = \text{kg}, \text{Range} = 5000, \text{Count - by} = 5$$

The graduations can be calculated, thus

$$\text{Graduations} = \frac{\text{Range}}{\text{Count - by}} = \frac{5000}{5} = 1000 \textit{divisions}$$

Signal voltages can be calculated as follows:

The full scale load cell signal is calculated thus:

$$\text{Full Scale Signal} = \frac{5000}{10000} \times 2.0 mV/V = 1.0 mV/V$$

Since the **5100** uses 8V loadcell excitation, the absolute signal voltage is:

$$\text{Absolute Signal Voltage} = 8V \times 1.0mV/V = 8.0mV$$

The signal resolution is calculated thus:

$$\text{Signal Resolution} = \frac{8.0mV}{1000divisions} = 0.008mV/division \equiv 8mV/division$$

Dual Interval and Dual Range Operation

The **5100** provides both Dual Interval and Dual Range modes of operation as well as the traditional single range setting. In non-trade operation, up to 100,000 divisions are available so it is rare for the precision of the displayed reading to be a problem. However, in Trade applications where the number of divisions that can be legally displayed is limited, the use of Dual Interval or Dual Range operation allows greater precision in the displayed readings without exceeding the maximum number of graduations available in the certification of the load cell.

Both of these modes of operation allow for the **5100** to operate with 2 count-by settings so that it is possible to weigh using fine increments for a low weight range, and coarse increments in a high range. For example, the **5100** could be configured to weigh up to 2kg in 1g increments and from 2kg up to 5kg using 2g increments.

Dual Interval and Dual Range are identical in many respects and can be treated the same for the purposes of setup and calibration. The difference between the two comes about in the operation of the scale. With Dual Range operation the range is determined based on the gross weight. Once the scale changes from low range to high range it may not change back to low range again until the scale is returned to a stable zero reading. Dual Interval operation however is based on the net weight and no restrictions are placed on the change from the high interval to the low interval. With Dual Interval operation it is therefore possible to weigh in the low interval with high tare weights.

The **5100** is equally accurate in either mode but due to hysteresis effects in many load cells it may not be possible for them to operate accurately in Dual Interval mode. In these cases, Dual Range mode ensures that the weight readings taken from the load cell are accurately displayed during loading and unloading operations.

Direct mV/V Operation

It is possible to calibrate the **5100** without test weights if the output capacity of the load cell is known. For applications like silo weighing where it is impractical to use test weights this mode of operation allows the mV/V signal strength at no load, as well as the mV/V signal strength of the span to be entered directly. This type of calibration is only as accurate as the load cell output figures but for many applications this is more than adequate. Extended features like multi-range and linearisation are not compatible with this form of calibration.

Filtering Techniques

The **5100** includes a number of advanced filtering options, which allow it to be optimised to produce the most accurate readings possible in the shortest time. There is a trade off between noise filtering and the step response time of the system. The step response is defined as the time between placing a weight on the scale and the correct stable weight reading being displayed. This does not effect the number of readings per second that are taken. It simply defines the amount of time that is required to determine a final weight reading.

FIR (Finite Impulse Response) Filter: The first level of filtering provided is a FIR filter that is linked to the measurement rate. The measurement rate is set in the SYNC option of the SPEC menu. This filter is a very high performance 'tuned' filter that provides up to 180 dB of attenuation at multiples of the SYNC frequency and broad band filtering of between 40 and 80 dB. For example, setting the SYNC frequency to 25Hz would provide 180 dB of noise rejection at frequencies of 25, 50, 75 … Hz.

Changes to the SYNC setting effect the calibration of the system, so it is wise to determine the primary noise frequency of the system prior to calibration. Often the primary noise source is the mains power so the SYNC is usually set to 50 or 60Hz depending on mains frequency. However for applications with high levels of mechanical noise it is better to tune this filter to the natural frequency of the scale. For example, a mixing paddle in a hopper scale may induce a vibration of 40 Hz.

The FIR filter introduces a delay of three samples to the step response. Thus, at a SYNC frequency of 50Hz, where readings are taken every 20 milliseconds, a delay of 60 milliseconds is introduced between a weight change and the final weight reading.

Digital Averaging: In addition to the FIR filter the 5100 has two levels of digital averaging. The first level is a fixed length sliding window average where the average of the last 'n' readings is calculated. As each new reading is taken the oldest reading is discarded and a new average calculated. The length of the window can be configured in steps from one reading to 200 readings, and is set using the FILTER setting in the OPTION group. Each reading in the average adds a delay to the step response equal to the measurement period. For example, an average of ten readings with a SYNC frequency of 50Hz results in the following total step response:

$$(10+3)_{\text{samples}} \times 20_{\text{milliseconds}} = 260_{\text{milliseconds}}$$

The second level of averaging is similar to the first but has a variable length window that grows from one reading up to a maximum of ten readings. If a disturbance on the scale is detected, the old readings are discarded and a new average starts all over again. Each of the ten readings are calculated over the window length of the fixed average. In this way very long term averages are calculated without introducing any delays. The amount of fluctuation that causes the averaging to be restarted can be selected from OFF, FINE or COARSE in the JITTER item under the OPTION group. The COARSE setting is more tolerant of weight change than the FINE setting, whilst the OFF setting disables this level of filtering.

Trade vs Industrial Mode

The **5100** may be operated in Trade or Industrial mode. Following is a list of the differences in operation for each of the two modes:

ITEM	TRADE	INDUSTRIAL
Underload	-1% or -2% of fullscale depending on zero range setting	-105% of fullscale
Overload	Fullscale +9 divisions	105% of fullscale
TARE	TARE values must be > 0	No restrictions on TARE
De-Zero	Not available	2 second press of the Zero Key will clear the zero setting
Test Modes	Limited to 5 seconds	Unlimited time allowed

Setup Counter

Within Digital Setup there are a number of critical steps that can effect the calibration and/or trade performance of the **5100**. If any of these steps are altered, the trade certification of the scale could be voided. These steps are automatically blocked in the Safe Setup.

The **5100** provides a built in Setup Counter to monitor the number of times the critical steps are altered. The value of this counter is stored within the unit, and can only be reset at the factory. Each time a critical step is altered, the counter will increase by one. Whenever the **5100** is powered up, or setup mode is entered, the current value in the counter is displayed briefly.

Passcodes

The **5100** has three levels of passcodes to provide a security lock on Digital Setup. An individual passcode is available to secure each of Safe Setup, Full Setup and the operator menus. The setup passcodes limit access to the setup menus, whilst the operator passcode restricts access to items within the operator menus. For example, recipe and material information.

Passcodes can be set from items (SPECIAL:PASSCD:SAFE.PC, SPECIAL: PASSCD:FULL.PC and SPECIAL:PASSCD:OPER.PC) in the Special group. **A setting of "000000" clears a Passcode and allows free access. This is the default setting and must be changed by the installer to restrict operator access.** Any other number will enable the passcode function and restrict access to the particular setup routines. In addition to the operator passcode, there is an operator access level, which controls which settings are freely available without passcode entry and which will require it. For example, it is possible to configure the **5100** to allow any operator to change the current batch but in order to change the target weights for the batch a passcode must be entered.

When a passcode is enabled, the **5100** will stop for passcode confirmation before entering Digital Setup or the operator menus. A value of 000000 will be displayed, and the correct passcode must be entered, in the standard numeric entry fashion. Correct entry of the code will allow access to Setup, whilst an incorrect passcode will trigger an error message and the display will return to normal weighing.

The passcodes may be cleared or changed at any time from Full Setup. **The passcode for the FULL Setup must not be forgotten, as it is only possible to circumvent it at the factory. Care must be taken with the use of the FULL Setup Passcode to ensure that the instrument does not become permanently locked.**

7. DIGITAL SETUP

7.1. Operation of the Digital Setup Menus

Entering Digital Setup

There are two ways to access the **5100** Digital Setup. To protect a number of settings critical to the correct operation of unit, a Safe setup option locks out some options. Full setup allows access to all options.

To enter Safe Digital Setup, press and hold the SET key for two seconds. The **5100** will beep twice, and display the following items: "SAFE SETUP 5100", Software Version, Setup Access Count. If a passcode has been configured, the safe setup passcode must be entered to gain access to the Setup. This passcode is entered (like any numeric value) using the keypad. The first item in the Group list (BUILD) is then displayed.

To enter Full Digital Setup, press and hold both the ZERO and SET keys for two seconds. The **5100** will beep twice, and display the following items: "FULL SETUP 5100", Software Version, Setup Access Count. If a passcode has been configured, the full setup passcode must be entered to gain access to the Setup. This passcode is entered (like any numeric value) using the keypad. The first item in the Group list (BUILD) is then displayed. **WARNING:** All items in all menus will be enabled in Full setup, and care should be taken to avoid inadvertently altering build and calibration settings.

Groups, Items, Subitems and the Setting Buttons

The **5100** is an advanced instrument providing a large number of facilities. To simplify configuring the unit, all setup options in the **5100** are organised in a tree structure made up of **Groups, Items** and **Subitems**. To simplify explanations, the following notation is used throughout the manual to identify the location of an item: (GROUP:ITEM) or (GROUP:ITEM:SUBITEM).

GRP

Groups (GRP)

Digital Setup is divided into a series of "Groups". Each group has a distinctive group title. All items in any one group have related functions. **GRP** is displayed if the **5100** is displaying a group title. The **[GRP]** key can be used to scroll through the available groups. Pressing the **[ITM]** key will enter the selected group, allowing access to the items within the group.

ITM

Items (ITM)

Each group is divided into numbers of individual "Items". Each item represents either a parameter that can be changed, or a set of subitems. **ITM** is displayed when selecting items or sub-groups of items from a group. The **[ITM]** key will advance through the list. Press the **[SEL]** key to edit the item or select items from the sub-group.

SEL

Subitems (SEL)

Where a large number of related settings exist, a sub-group of sub-items is included under an item. **SEL** is displayed when selecting items within a sub-group. Press the **[SEL]** key to select a particular item and press **[OK]** to edit.

For example, the group SPEC holds all of the items for passcodes, key functions and operation modes. All of the items associated with passcodes and security have been grouped into a sub-group within SPEC called PASSCD. This would be written (SPEC:PASSCD).

The role of each of the primary keys during editing is displayed on the LCD above each of the keys. These functions are as follows:

GRP	Zero Key	Steps through the list of groups. If this is displayed then the **5100** is showing a Group Heading.
ITM	Tare Key	Steps through the list of items and sub-groups. If this is displayed then the **5100** is showing a item or sub-group Heading.
SEL	Gross/Net Key	Steps through the list of items within a sub-group or moves the editing cursor in some editing modes.
EDT	Print Key	Steps through the available options when editing a particular item.
OK	Function Key	Press this key to edit an item or to save changes and return to the menus.

The C/M- key is used as an undo key during editing. At any point in the process the C/M- key will cancel the last operation. Use this key to reverse direction when selecting any items from lists or to perform a 'backspace' function when entering numbers. A long press of this key will perform an ABORT operation and return to the menu without making any changes.

7.2. Scale Build - (BUILD)

Items within this Group are used to configure the indicator to suit the current application. It is important to fully set the options within this group before calibration is attempted, as later changes to items within this group may invalidate the current calibration data. Items marked with Ä indicate a setting that can only be altered from full setup.

(TYPE) Display Type Ä

Selects the type of display to suit the application. This can be set for Single Range, Dual Interval or Dual Range, or Direct mV/V operation.

(DP) Decimal Point Position Ä

Sets the location of the decimal point on the display. To avoid confusion, set this parameter first so that all other weight related values are displayed with the decimal point in the correct position.

Can be set from 000000 (none) to 0.00000.

(CAP1) Maximum Capacity (Lower Range) 1 Ä

Sets the nominal maximum capacity (or Range) of the scale in single range mode, or sets the maximum value of the lower range in dual mode. This is set in weighing units (e.g. kg, t etc) with the decimal point in place. For example, if a scale is to weigh 500.0 kg in 0.5 kg increments, then set CAP1 to 500.0, and set E1 to 0.5.

(E1) Count By (Lower Range) 1 Ä

123

Sets the resolution (or Count-by) of the display for single range, or sets the resolution of the lower range in dual mode. The resolution is the number by which the indicator will count by. This is set in weighing units with the decimal point in place.

Values of 1, 2, 5, 10, 20, 50 or 100 can be set.

(CAP2) Maximum Capacity (Upper Range) 2 Ä

123

Sets the maximum capacity of the upper range in Dual Range and Dual Interval modes. This defines the maximum capacity of the scale in Dual Range or Dual Interval modes. This setting is ignored in single range mode. For example, if a scale is to weigh in 0.05 kg to 100.00 kg and then in 0.10 kg to 300.00 kg then set CAP2 to 300.00, E2 to 0.10, CAP1 to 100.00 and E1 to 0.05.

(E2) Count By (Lower Range) 2 Ä

123

Sets the resolution (or Count-by) of the upper range in dual mode.
This is set in weighing units with the decimal point in place.

Values of 2, 5, 10, 20, 50, or 100 can be set.

(UNITS) Units of Measure Ä

SEL

Sets the units of measure for display and printing.
Options available are: (g) grams, (kg) kilograms, (lb) pounds, (t) tonnes, (NONE) other units.

Default: kg

7.3. Scale Options - (OPTION)

Items within this Group are used to configure the operating parameters of the scale. Only some of these items may be changed after calibration without effecting the calibration accuracy. Items marked with Ä indicate a setting that can only be altered from full setup.

SEL

(USE) Scale Use Ä

The basic use of the scale must be set here. This setting configures the **5100** for either Industrial or Trade operation. Trade configuration will limit the operation of the unit to comply with OIML provisions. Industrial configuration removes all restrictions on operation.

Available options are: INdUST or TRAdE. Default: INdUST.

SEL

(FILTER) Reading Average

The **5100** can average a number of sequential readings when calculating the displayed weight. This is used to dampen unwanted weight fluctuations caused by vibrations or dynamic forces. High settings will stabilise the display at the expense of rapid response to sudden weight changes.

Available options are: 1..10, 25, 50, 75, 100, 200. Default: 10

(JITTER) Anti-jitter Weight Stabilisation

This feature can automatically damp out small weight fluctuations without effecting the speed of response to rapid weight changes (separate to averaging). Useful for stabilising minor changes in weight readings.

Available options are: OFF, FinE, or CoArSE. Default: OFF

(MOTION) Motion Detection Ä

Sets how much weight variation over a defined time period is allowed before the displayed weight is deemed to be unstable. This value is displayed in weight change (0.5, 1.0, 2.0 or 5.0 graduations) per time period (1.0, 0.5 or 0.2 seconds). When set to “none”, the Motion Detection is ignored and ZERO, TARE and PRINT actions are instantaneous. Motion can be set from 0.5 count-bys per 1.0 seconds (fine) to 5.0 count-bys per 0.2 seconds (coarse).

Default: 0.5 -1.0 t

(AUTO.Z) Auto-Zero on Startup

This function can be used to automatically ZERO the indicator during power-up. The amount of weight that can be zeroed is limited to +/- 10% of Range.

Available options are: ON or OFF. Default: OFF

(Z.TRAC) Zero Tracking Sensitivity Ä

Zero tracking allows the display to adjust for minor changes in the zero balance of the scale. The zero track limit sets the fastest rate of change that is allowed to be compensated automatically. This value is displayed in the number of graduations (0.5, 1.0, 2.0 or 5.0) per time period (1.0, 0.5 or 0.2 seconds). When set to “none”, the Zero Tracking is disabled.

Rate of weight change can be set from 0.5 graduations per 1.0s (fine) to 5.0 graduations per 0.2 s (coarse). Default: None

(Z.RANGE) Allowable Zero Operating Range Ä

This setting restricts the range over which the Zero functions can operate.

Set in steps from -1%, -3% to ±100%. Default: 02 - 02 (-2% to +2%)

(Z.BAND) Zero Dead Band Ä

This is an adjustable margin either side of true zero that defines the Zero Dead Band. The Zero Dead Band is used by the automated functions of the **5100** to determine ‘Zero Load’. E.g. a setting of 4 specifies that readings between -4.5 and 4.5 are considered to be zero.

Settable over the full weight range. Always enter a number in multiples of display units (see E1 in BUILD). Default: 0 (i.e. -0.5 to 0.5)

7.4. Scale Calibration - (CAL)

Items within this group perform various calibration routines. For scale calibration procedures refer to Section 8: CALIBRATION (Page 39). Certain items in the Scale Build, Special and Options sections can effect the calibration of the scale. Always check that these sections are correctly configured to suit the current application before attempting to calibrate the scale. Items marked with Ä indicate a setting that can only be altered from full setup.

(ZERO) Zero Calibration Ä

Select to start a Zero Calibration. While the zeroing is in progress the display will show 'Z.IN.P'. For a detailed description on the zeroing and calibration procedures, refer to Section 8 (Page 39).

(SPAN) Span Calibration Ä

Select to start a Span Calibration. While the span calculation is in progress the display will show 'S.IN.P'. For a detailed description on the span and calibration procedures, refer to Section 8 (Page 39).

(ED.LIN) Edit Linearisation Points Ä

Select to view linearisation setup and start linearisation routines. For more information on linearisation, refer to Section 8.3 (Page 41).

(CLR.LIN) Clear Linearisation Points Ä

Select to view linearisation setup and select linearisation points to clear. For more information on linearisation, refer to Section 8.3 (Page 41).

(FAC.CAL) Restore Default Factory Calibration Ä

Select this to restore default factory calibration. This restores all settings in the Build and Cal menus back to factory defaults.

7.5. Special Settings Menu - (SPEC)

Items marked with Ä indicate a setting that can only be altered from full setup. Items within this group control features including passcodes, button locking, key functions and display settings.

(PASSCD) Passcodes

The passcodes subgroup contains settings used to limit access to particular items in the **5100**.

(SAFE.PC) Security passcode for Safe Digital Setup

The passcode for safe digital setup prevents access to safe setup, and can be entered from this subitem. A setting of 000000 bypasses the passcode function and allows free access.

Range 000000 to 999999. Default: 000000.

(FULL.PC) Security passcode for Full Digital Setup Ä

The passcode for full digital setup prevents access to full setup, and can be entered from this subitem. A setting of 000000 bypasses the passcode function and allows free access.

Range 000000 to 999999. Default: 000000.

(OPER.PC) Security passcode for Operator Setup

The passcode for operator setup prevents access to the operator menus, and can be entered from this subitem. A setting of 000000 bypasses the passcode function and allows free access to the operator menus.

Range 000000 to 999999. Default is 000000.

(OP.ACC) Operator Access Level

The operator access level defines which parameters are available to the operator without the need to enter the operator passcode. The following list specifies which parameters are available at each level. Parameters up to and including the level are all available, thus level 2 access permits access to Level 2 and Level 1. Available options are:

0: None (All parameters require passcode)
1: Current Recipe
2: Recipe Proportion
3: Recipe Preset Tare
4: Recipe ID and Print Header
5: Recipe Targets
6: Recipe Flight Settings
7: Tolerances (All parameters are available)

Default: 0

(BUTTON) Operating Buttons Setup Ä

This item allows individual buttons to be locked and unlocked. The following settings are available each key: Y – enabled, N – disabled, I – immediate operation (don't wait for motion to cease). The display will show YYYY, where each character represents the ZERO, TARE, GROSS/NET and PRINT buttons, respectively.

(FUNCTN) Button Functions

The button functions subgroup configures all user defined keys (the user defined front key and the five remote (external) keys).

(FRONT) User Defined Front Panel Key Function

Sets the function of the front panel user defined key. See Section 11 (Page 66) for a detailed description of each of these functions.

Default: NONE

(REM 1..REM 5) Remote Key Functions 1 to 5

Sets the function of the external inputs on the setpoint or combo cards. See Section 11 (Page 66) for a detailed description of each of these functions. Note that remote keys 1 to 4 are allocated to the setpoint card, and remote key 5 is allocated to the combo card.

Default: NONE

(ID.TYPE) Identifier Type

Sets the type of the recipe identifier. Available options are:

Alpha: Identifiers may contain both letters and numbers
Number: Identifiers are numeric only

Default: Alpha

(B.LIGHT) Backlight Operation

Sets to operation of the backlight. Auto backlighting specifies the amount of idle time required before the backlight is turned off. Available options are:

OFF: Backlight is off
ON: Backlight is always on
AUTO.10: Backlight turns off after 10 seconds of idle time
AUTO.30: Backlight turns off after 30 seconds of idle time
AUTO.60: Backlight turns off after 60 seconds of idle time

Default: OFF

(AUX.DSP) Auxilary Display

This sets the function of the auxiliary display. Available options are:

OFF: Blank
TIME: Displays the current time in 12 hour format
RECIPE: Displays the current recipe number
FILL.PC: Shows the percentage completion of each material fill during batching

Default: Off

(SYNC) A/D Synchronisation Frequency Ä

WARNING - This setting will affect the calibration of the indicator and should be set before calibration is done.

The A/D Synchronisation Frequency sets the primary anti-noise filter of the **5100**. It will deliver optimum stability in a 50Hz environment when set to 50Hz. Set in cycles per second between the limits of 15 to 60Hz. This also sets the number of readings taken per second. For example, a setting of 50 means that the unit will take 50 readings per second.

Default: 50

7.6. Communications Options - (SERIAL)

Items within this Group set the serial and printing outputs. The Items relating to particular task are combined to form a list. To manipulate the list, continue to press the **[SEL]** key to select the item of interest and press the **[OK]** key to edit. Press **[ITM]** to return to the list. Serial configuration is discussed in more detail in Section 9 on Page 43.

(SER1) Serial Output 1

Sets the function of the first serial output. The port can be disabled, or set to run as an automatic output or a network device.

OFF:	Disables serial output 1
Auto.Lo:	Enables automatic transmission at 10Hz
Auto.Hi:	Enables automatic transmission at the frequency entered in the SYNC menu item (Section 7.5, Page 26)
SinglE:	Single transmission of data triggered by the SING.1 external input
NET:	Sets the 5100 to function as a network device
PLCA:	Mitsubishi FXos-30MR-ES PLC interface for setpoint driving
PLCb:	NaiS FP0 PLC interface for setpoint driving

Default: NET

(SER2) Serial Output 2

Sets the function of the second serial output. The port can be disabled, or set to run as an automatic output or as a printer driver with DTR handshaking.

OFF:	Disables the output
Auto.Lo:	Enable Auto transmit at 10 Hz
Print:	Enable the output for printer driving
SinglE:	Single transmission of data triggered by the SING.2 external input
PLCA:	Mitsubishi FXos-30MR-ES PLC interface for setpoint driving
PLCb:	NaiS FP0 PLC interface for setpoint driving

Default: Print

(NET.OPT) Network Options

The network options subgroup contains items concerned with networking.

(ADDRESS) Serial Address

This is the address of the **5100** that is used in network applications.

Range 00 to 31. Default: 31

(TYPE) Network Type

Select the network protocol. Available options are:

Net.A:	Ranger networking
Net.b:	Modbus networking

Default: Net.A

(AUT.OPT) Auto Transmit Options

The automatic transmission options subgroup configures items concerned with serial transmission of weight data.

(TYPE) Auto Output Format

SEL

Sets the format for automatically transmitted data. A detailed description of these formats is given in Section 9.1 (Page 43). Available options are:

Auto.A:	Format A - Standard Ranger output format
Auto.B..Auto.E:	Formats B through E
Auto.F:	Format F - User programmable output format

Default: Auto.A

(SRC) Auto Output Source

Select the weight source for the automatically transmitted data. Available options are:

dISP:	Displayed reading
GroSS:	Gross Weight
NET:	Net weight
Total:	Total weight
FULL:	All data displayed is transmitted

Default: dISP

(AUT.FMT) Auto Output Format

ABC

Program the auto output format when using Auto.F formatting. Up to 20 literal characters and special tokens can be entered to define the details of the serial output format.

Default: "" (No format specified)

(ST.CHR) Start Character

123

Sets the character sent at the start of the automatic message string. Can be set to any valid ASCII character. If set to Null (00), no character will be sent in this position.

Default: 02 (Start of Text (STX))

(END.CH1) First End Character

123

Sets the first of the two characters sent at the end of the automatic message string. Can be set to any valid ASCII character. If set to Null (00), no character will be sent in this position.

Default: 03 (End of Text (ETX))

(END.CH2) Second End Character

123

Sets the second of the two characters sent at the end of the automatic message string. Can be set for any valid ASCII character. If set to Null (00), no character will be sent in this position.

Default: 00 (No character sent)

(PRN.OPT) Print Options

The print options subgroup contains all items associated with printing.

(TYPE) Printer Output Type

Sets the type of printout sent via a serial port configured for printing when the PRINT button is pressed. Detailed descriptions of each printout are given in Section 9 (Page 43). Available options are:

NonE:	No printout. Use this to suppress printing of individual weights in a total
SING:	Print a single line with no extra line feed
doub:	Print single line output but double spaced
tic:	Print full weight ticket
Custom:	Custom Ticket format

Default: SINg

(MODE) Printing Mode

Selects the printing mode from one of the following:

MANUAL:	Manual printing using the print key
AUTO:	Automatic printing with every new stable reading
TOTAL:	Manual totalising using the print key
A.TOTAL:	Automatic totalising

Default: MANUAL

(HEADER) Ticket Header

The custom ticket header can be entered here. This header may also be modified from the operator ID menu during normal operation.

Default:
```
WEIGHT
TICKET
```

(TIC.FMT) Ticket Format

A custom ticket format can be entered here. Refer to Section 9.3 starting on page 47 for information on custom ticket format entry.

Default: "" (Blank)

(SPACE) Margin Space

The margin space item allows the number of rows and columns of space to leave for each printout can be entered in cc.rr format. "cc" specifies the number of columns of blank space and "rr" specifies the number of rows of blank space. "rr" can be set from 0..9 to select up to 9 rows of blank space. A value of 10 will force a printer Form Feed.

Default: 00.00 (zero columns and zero rows)

(BAUD) Serial Baud Rate

The baud rate item determines the serial data transmission speed for both serial ports.

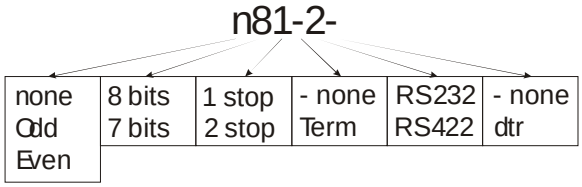
Available options are: 300, 600, 1200, 2400, 4800, 9600 and 19,200. Default: 9600

(BITS) Serial Format Options

OPT

The bits options allow the data transmission bit pattern and interface to be changed. The display will show the current setting in the form (n81-2-) where each character has a meaning as shown below. When either PLCA or PLCb are being used, the serial format will be locked to the PLC settings. Available options are:

n,O,E:	Parity bit
8, 7:	The number of data bits
1, 2:	The number of stop bits
-, t:	Termination resistors
2, 4:	Interface: RS232/RS422.
-, d:	DTR handshake disabled/enabled



Default: n81-2-. For most applications the default setting is applicable.

7.7. Set Points - (SET.PTS)

Items within this group configure the operational logic of the setpoint system. Refer to Section 10: SETPOINTS (Page 52) for a detailed explanation of batching and setpoints.

(DEFLT) Configure using Default Applications

SEL

Use this item to pre-configure setpoint operation to one of the pre-programmed standard applications. This process fills out the setpoint type and options.

(SET.TYP) Setpoint Type

Sets the type and options for each setpoint. The **[SEL]** key will scroll through the list of setpoints, and the currently configured type will be displayed in the auxiliary display.

(SETP 1 .. SETP25) Setpoint Types 1..25

SEL OPT

Selects the type for each of the 25 setpoints. Refer to Section 10.3 (Page 55) for details on the different setpoint types and options.

Pressing **[OK]** after selecting a setpoint will bring up the setpoint options. These options vary depending on the type of setpoint.

Default: NONE

(GEN.OPT) General Options

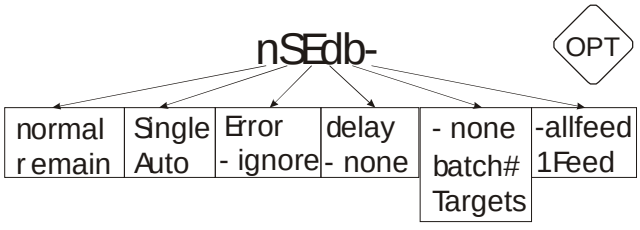
General setpoint options including automatic inflight adjustment and tolerances.

(OPTION) Operating Options

OPT

Select the operating options for the **5100**.

These options are discussed in detail in Section 10.4 page 58.



Default: 'nSEdb-'

(FLT.ADJ) In-flight Adjustment

In-flight settings can be automatically adjusted to remove batching errors. The inflight adjustment sets the percentage of a batch error that is used to correct the inflight value. Note that an in-flight setting can not be adjusted by more than 50% of its current value regardless of the batching error.

Default: 0%

(TOL) Tolerance Options

Sets the response to an out of tolerance condition.

Default: NONE

(AUT.CLR) Automatic Clear Options

Sets which items are cleared at the end of the batch. This allows proportion settings or Recipe 1 targets etc to be cleared automatically.

Default: NONE

(PROP.PC) Proportion Percentage

Sets whether recipe proportion is entered in percentage or not.

Default: ON

(LABELS) Labels

Configuration of labels for material names.

(NAME 1..NAME20) Names 1..20

Set a six character label (material name) for up to 20 materials. Only the materials used are presented in the list.

Default: 'MAT__1' .. 'MAT_20'

(DELAY) Delay Settings

Delay settings for materials and finish relays.

(DELAY1..DLY20) Delays 1..20

Sets the individual delays at the end of the fill for each material.
Default: 1.0 second

(FINISH) Finish Delay

Sets the time for the operation of a Finish Relay .
Default: 1.0 second

Jog Settings

Configures global and material specific jog settings.

(JOG1..JOG20) Jogs 1..*20*

Sets the on time for any material that is using auto-jogging.
Default: 0.5 seconds

(JOG.OFF) Jog Off Settings

Sets the off time between each jog in 0.1 second increments. This setting applies to all materials with auto-jogging enabled.

Default: 1.0 seconds

(JOG.SET) Jog Cycles

Sets the number of jog cycles to be performed before the **5100** waits for no motion. This setting applies to all materials with auto-jogging enabled.

Default: 1

7.8. Analogue Settings - (ANALOG)

Items within this group set the options for the optional analogue output and combo cards.

(SRC) Analog Output Source

Select the reading source for analogue output. Available options are:

DISP: Displayed weight reading, either gross or net.
GROSS: Gross weight only.
Net: Net weight only.
Default: DISP

(TYPE) Analog Output Type

Selects a range of voltage or current outputs. Available options are:

OFF: Analog Output Disabled
Volt: Voltage Output (-10v to 10v, 0v at 0 weight)
Cu.r: 4-20 mA current output
AbS.Cur: Absolute weight reading, output as 4-20mA current output
Default: OFF

(CAL.LO) Calibrate Zero Output

This allows a fine calibration of the analogue output corresponding to zero weight at either 4mA or 0V, depending on the Analog Output Type.

(CAL.HI) Calibrate Fullscale Output

This allows a fine calibration of the analogue output corresponding to fullscale weight at either 20mA or 10V, depending on the Analog Output Type.

NB: The range of adjustment in Zero and Fullscale is around 9mA or 7VDC which allows for a complete range of voltage or current outputs. For example it is possible to setup the voltage output to operate from 2..10V, 1..5V, 0..10V etc by changing the Zero and Fullscale analogue calibrations.

(FRC.ANL) Test Analogue Output

Test analogue output. This function toggles the analogue output between low (0V or 4 mA) and high (10V or 20mA), to allow the analogue output function to be tested independent of the weight readings.

7.9. Clock Settings - (CLOC)

Items within this group set time and date related functions. Items marked with Ä indicate a setting that can only be altered from full setup.

(TIME) Set Time

The correct time may be entered in this item. The time is entered in the format (00.HH.MM), where HH is the hours in 24 hour format (00-23) and MM is the minutes (00-59).

(DATE) Set Date

The current date may be entered in this item. The date is entered in European format (DD.MM.YYYY), where DD is the day of the month (01 – 31), MM is the month of year (01 – 12) and YYYY is the year (1998 – 2098). The **5100** requests the day and month first, followed by the year.

(QA.OPT) QA Option Setting Ä

Enables/disables the Quality Assurance Calibration Due alarm. When enabled the **5100** will display “QA DUE”, from the day after the date set in the QA.DATE item below. Available options are:

OFF: Turn feature off.
ON: Turn feature on.

Default: OFF

(QA.DATE) QA Date Ä

The date when the next calibration check is due may be entered in this item. The date is entered in European format (DD.MM.YYYY), where DD is the day of the month (01 – 31), MM is the month of year (01 – 12) and YYYY is the year (1998 – 2098).

Default: 01/01/1999

7.10. Special Test Section - (TEST)

Items within this Group allow access to the testing routines for the **5100**. With these routines the scale base output can be monitored, and the optional accessory cards can be tested.

(SCALE) Scale Base Test Display

Used to test the scale base for load cell or connection errors. Sets up the **5100** as a simple test meter to measure the load cell input. Display reads in millivolts per volt, factory calibrated to 0.1% worst case. In TRADE mode this display is only active for 5 seconds before returning to the menu.

(HI.RES) High Resolution Display for Scale Testing

Allows the high resolution (x 10) display mode to be turned ON or OFF. Once enabled, the **5100** will remain in high resolution mode until switched back to normal weighing in this step. In safe setup mode the (x10) weight reading is displayed for 5 seconds before returning to the menu. The high resolution can only be changed permanently in Full Setup.

(FRC.OUT) Force Outputs of Setpoint Card

Forces each of the output drivers of the Setpoint card in turn. All outputs turn OFF when leaving this step. **Serial PLC outputs are NOT activated by this test.** The **[EDT]** key will advance through each output, whilst pressing the **[OK]** will turn all outputs off and exit the test.

(TST.INP) Test Inputs of Setpoint Card

The input test allows each of the inputs from the setpoint or combo card to be tested. All five external inputs are displayed at the same time. The status of each input is changed as contact closures are detected. A "-" indicates an input is not present, whilst a number (1..5) indicates a particular input is active. For example, " - - 3- - " would indicate that input number three is active. Note that inputs one to four are assigned to the setpoint card, whilst input 5 is assigned to the combo card.

7.11. Factory Adjustment Menu - (FACTRY)

(DEFLT) Restore Factory Defaults

Restores the digital setup of the **5100** back to the original "new" settings installed at the factory. The main use of this routine is to completely reset a **5100** that is being installed on a different scale. Restoring the factory defaults does not affect the calibration. To reset the calibration to factory condition, the Restore Factory Calibration (CAL:FAC.CAL) should be used.

(FAC.RST) Factory Reset

Factory access only.

(CONFIG) Software Options

Use this item to enter software option codes to enable optional features in the **5100**. This is the same as pressing the SET and FUNCTION keys together for 2 seconds to enter the software option codes directly.

7.12. Leaving Digital Setup - (-END-)

There are a number of methods available to exit Digital Setup and return to normal operation. The first method is as follows:

1. Press the **[GRP]** key repeatedly until the **-END-** group header appears in the display.
2. Press the **[OK]** button to exit the setup. The **5100** will display “Saving” before returning to normal operation.

This is the preferred method for exiting all Rinstrum menu systems. Another method to exit Digital Setup is to press and hold the **[SET]** key for two seconds. The **5100** will display “Saving” before returning to normal operation.

8. CALIBRATION

The calibration of the **5100** indicator is fully digital. The calibration results are stored in permanent memory for use each time the unit is powered up.

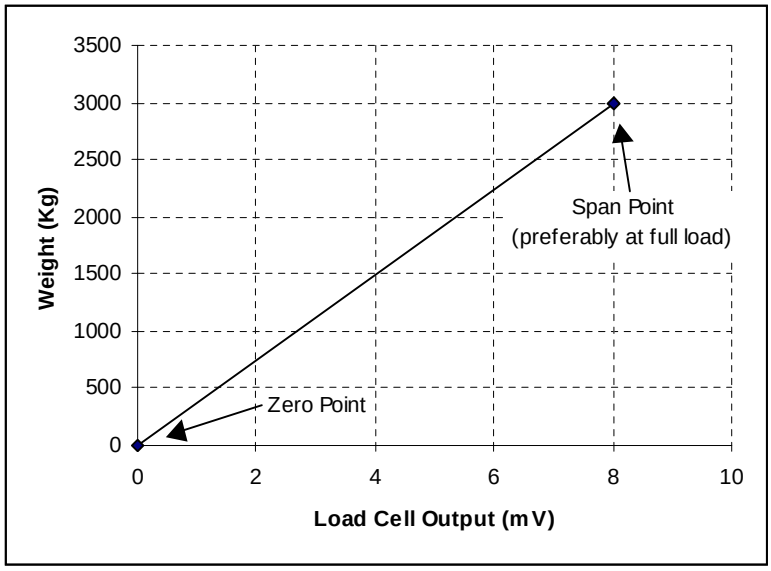
Some of the digital setup steps can effect calibration. The (BUILD) and (OPTIONS) groups of the digital setup MUST be configured before calibration is attempted. Most importantly, the (TYPE) and (SYNC) settings must not be changed after calibration.

To perform a calibration, select the (CAL) Group using **[GRP]**. Due to restrictions in Trade Use applications, the Calibration Routines are not available in Safe setup. Calibration can be accessed only through the Full Setup.

The calibration programme will automatically prevent the **5100** from being calibrated into an application outside of its specification. If an attempt is made to calibrate the **5100** outside of the permitted range, an error message will show and the calibration will be abandoned. Refer to Section 13: Error Messages on Page 73.

The **5100** has a wide-range amplifier. The non-trade calibration range of the instrument extends well beyond the Trade approved range. **It should not be assumed that just because the 5100 has successfully calibrated a scale, that the scale is correct for trade use. Always check the scale build against the approval specification.**

8.1. Performing a Digital Calibration with Test Weights



This type of calibration is used for single range as well as dual range and dual interval modes of operation. The Zero setting (CAL: ZERO) specifies a gross zero point for the scale. The Span setting (CAL:SPAN) specifies a second point (preferably close to fullscale) used to convert the A/D readings into human readable units (e.g. Kg). Select either of the Zero (CAL:ZERO) or Span (CAL: SPAN) calibration items. It is important that an initial Zero calibration is performed before any SPAN calibrations. The chart shown here demonstrates how the **5100** uses the zero and span points to interpolate a weight reading from the load cell reading.

(ZERO) Zero Calibration Routine

- Press the **[OK]** button to start the zero routine running. The display will show the current weight. Remove all weight from the scale structure.
- Press the **[OK]** button again to execute a Zero Calibration. The display will show (Z.IN.P) to indicate that zeroing is in progress. When the process is complete the display will return to weight to allow the zero to be checked.
- Press the **[ITM]** button to leave the Zeroing routine or **[OK]** to repeat the operation.

(SPAN) **Span Calibration Routine**

- Press the **[OK]** button to start the Span setting routine. The display will show the current weight on the scale.
- Add the calibration test mass to the scale. The minimum acceptable span calibration weight is 2% of the scale range. A weight this small may the limit calibration accuracy. The closer the test weight is to full range, the better the accuracy.
- Press the **[OK]** button to show the calibration weight value. Enter the correct calibration weight using the numeric keys. Use **[CLR]** to correct any wrong numbers entered.

- Press the **[OK]** button to trigger the Span Calibration routine. The display will show (S.IN.P) to show that spanning is in progress. When the process is complete the display will return to weight to allow the new weight reading to be checked.
- When the Span Calibration is complete, press the **[ITM]** button to leave the Spanning routine or **[OK]** to repeat the operation.

8.2. Direct mV/V Calibration

This type of calibration is only used when the direct mV/V mode of operation (BUILD:TYPE) is selected. Press **[ITM]** to choose the ZERO or SPAN calibration Item.

(ZERO) **Zero Calibration Routine**

- Press the **[OK]** button to start the zero routine running. The display will show the current weight.
- Press the **[OK]** button again to enter the mV/V signal strength reading for zero load. The mV/V signal for the weight on the scale at this time is used as the default. If there is no load on the scale then use the mV/V setting as is, otherwise enter the correct mV/V reading for zero weight by using the numeric keys.

- Press the **[OK]** button to accept this setting as the zero calibration.
- Press **[ITM]** to leave the zeroing routine or **[OK]** to repeat the operation.

(SPAN) **Span Calibration Routine**

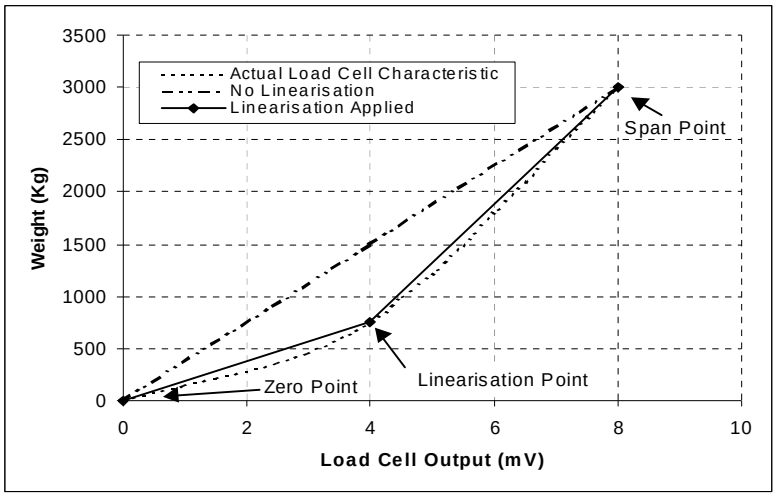
- Press the **[OK]** button to start the Span setting routine. The display will show the current weight on the scale.
- Press the **[OK]** button again to enter the mV/V reading for span.
- Use the numeric keys to enter the mV/V reading to equal the calculated span mV/V for the scale. The span mV/V is the calculated difference in signal between zero weight and fullscale weight on the scale base.

- Press the **[OK]** button to accept this setting as the span calibration.
- Press **[ITM]** to leave the spanning routine or **[OK]** to repeat the operation.

8.3. Using the Linearisation

This section provides instructions on the use of the linearisation. Linearisation is not permitted for a scale build (BUILD:TYPE) of Direct mV/V operation. Linearisation is used to approximate the weight output to a non-linear scale. The chart below shows a non-linear characteristic for the load cell output. From the chart, it can be seen that the trace with no linearisation applied is a poor approximation to the real characteristic. By applying one or more linearisation points, a more realistic approximation can be made.

To perform a linearisation, a calibration of the zero and span points must have been performed. Both the zero and span calibration points are used in the linearisation of the scale base. These two points are assumed to be accurately set and thus have no linearisation error. Note that the linearisation points are not restricted to lie between the zero and span points. They may also be placed above the span point, and below the zero point.



A maximum of five linearisation points can be set independently anywhere in the operating range of the scale. Unused or unwanted points may be also cleared.

(ED.LIN) Edit Linearisation Points

- Press the **[OK]** button to view the list of linearisation points currently in use.
- Press the **[SEL]** button to step through the list of points. Each point is shown as 'LN.PPP' where N is the point number (1..5), and PPP is the approximate percentage of full scale where the linearisation is applied. For example, 'L1 50' indicates that linearisation point one is active and was entered at about 50% of full scale. Unused linearisation points are shown with a row of dashes (e.g. 'L2.---').
- Press **[OK]** to change the linearisation point selected or press **[ITM]** to exit without making any changes.
- After pressing **[OK]**, the current weight reading is displayed. Add the calibration test mass to the scale. The closer the test mass is to the point of maximum error in linearity the more effective will be the correction. Press **[OK]** to enter a corrected weight value for this point or **[ITM]** to exit without making changes.
- Use the numeric keys to enter the correct value of the calibration weight being used.

- Press the **[OK]** button to trigger the Linearisation routine. When the process is complete the display will show the weight to allow the new weight reading to be checked before returning to the menus. Press **[ITM]** to leave the routine or **[OK]** to repeat the operation.

(CLR.LIN) Clear Linearisation

- Press the **[OK]** button to view the list of linearisation points currently in use.
- Press the **[SEL]** button to step through the list of points. Each point is shown as 'LN.PPP' where N is the point number (1..5), and PPP is the approximate percentage of full scale where the linearisation is applied. For example, 'L1. 50' designates that linearisation point one is active and was entered at about 50% of full scale. Unused linearisation points are shown with a row of dashes (e.g. 'L2. ---').
- Press **[OK]** to clear the linearisation point selected or press **[ITM]** to exit without making any changes.
- Once **[OK]** has been pressed, the linearisation point will be cleared, and the display will return to 'CLR.LIN'.

9. The Serial Outputs

The **5100** provides a number of serial output options allowing communications with external devices such as printers, computers, PLCs or remote displays. Serial output driving is an optional extra which may be ordered at the time of purchase and enabled at the factory or enabled at a later date by entering the specific software option code for the instrument. See Section12.5 on page 72 for more information on the **5100** software options.

Two serial outputs are available, each on a separate DB9 connector socket. For wiring connections and pinouts, please refer to Section 3.6 (Page 7). The **5100** requires an external converter to transmit in TTY Current Loop (20mA). Serial Port 1 is bi-directional (in both RS232 and RS422/485). The functions available for serial port 1 include:

- Single and Automatic Weight Output
- Networked Communications
- PLC Output Driving

Serial Port 2 provides RS232 transmission (with DTR handshake) only, and can be configured to perform the following functions:

- Single and Automatic Weight Output
- Weight Printing
- PLC Output Driving

All printer and serial output options are enabled and configured using the Communications Options Menu (Serial) in the digital setup procedure. The function of the serial ports is configured from the Serial group, via items Ser1 and Ser2.

Note that both serial ports share the same baud rate and format. The baud rate and bit settings can be changed from the Serial group, under the Baud (SERIAL:BAUD) and Bits (SERIAL:BITS) items, respectively.

Computer communications can range from simple automatic “streamed” output, through to multi-drop networked systems. The **5100** can be programmed and calibrated via the network. The setup counter is incremented when the calibration related steps are accessed via the serial port. This means that calibration via the serial port cannot be carried out without effecting the certification of a trade installation.

Printer driving allows for three basic printer outputs along with printer totalising. The format of the printer ticket may be changed to suit any application by entering special characters into the custom ticket format definition string. An automatic print mode is available where the **5100** automatically generates printouts at the appropriate time in the weighing process.

9.1. Single and Automatic Weight Output from the 5100

The automatic output is normally used to drive remote displays, a dedicated computer or PLC communications. The output generates a simple, configurable weight message at intervals programmed in the digital setup. The Single and Automatic facilities are available from both serial ports, however the second port does not offer the same number of automatic options. The format for both the single and automatic outputs is set by Auto Output Type (SERIAL:AUT.OPT:TYPE).

Auto Weight Format String

The **5100** Auto Weight String consists of a programmable start character, followed by a weight format string, followed by two programmable end characters. The weight format string can be one of five standard strings, or a user programmable string. In a standard weight format string, the weight reading is selected according

to the weight source (SERIAL:AUT.OPT:SRC) setting. In a user programmable weight format string, the weight source is selected via codes in the string. Weight format strings have the following format:

START - <Weight Format String> - END1 - END2

Where:

START is the character (SERIAL:AUT.OPT:ST.CHR). *Default: ASCII 02.*
END1 is the 1st end character (SERIAL:AUT.OPT:END.CH1). *Default: ASCII 03.*
END2 is the 2nd end character (SERIAL:AUT.OPT:END.CH2). *Default: ASCII 00.*

Note: START, END1 or END2 characters which have been set to NULL (ASCII 00) are not transmitted. Another common alternative configuration is START = NULL, END1 = CR (ASCII 13), END2 = LF (ASCII 10).

Weight Formats A to F

The five standard weight formats are detailed below.

Format	Description
A	**Sign WeightA(7) Status**
B	**Status Sign WeightA(7) Units(3)**
C	**Sign WeightA(7) S1 S2 S3 S4 Units(3)**
D	**Sign WeightA(7)**
E	**Sign WeightB(7) S5 Units(3) Mode(4)**
F	**Programmable weight format**

Where

Sign	is the sign of the weight reading (space for positive, '-' for negative);
WeightA	is a seven character string containing the current weight including the decimal point. If there is no decimal point, then the first character is a space. Leading zero blanking applies.
WeightB	is a seven character string containing the current weight including the decimal point. If no decimal point is used a decimal point follows the 6 digits of weight data. Leading zeros are shown;
Status	provides information on the weight reading. The characters G/N/U/O/M/E represent Gross/Net/Underload/Overload/ Motion/Error, respectively.
Units	is a three character string, the first character being a space, followed by the actual units (E.g. " kg" or " t"). If the weight reading is not stable, the units string is sent as " ".
S1	displays "G"/"N"/"U"/"O"/"E" representing Gross / Net / Underload / Overload / Error, respectively;
S2	displays "M"/' ' representing motion/stable, respectively;
S3	displays "Z"/' ' representing center of zero/non-zero, respectively;
S4	displays "1"/"2"/"-" representing range 1/2 in dual-interval and dual range mode and "-" otherwise;
S5	displays " "/"m"/"c" representing stable/motion/over or under capacity, respectively;

Mode 4 characters '_g_ _' or '_n_ _' for gross or net weight.

Auto Transmit Formatting

The Auto Format (SERIAL:AUT.OPT:AUT.FMT) setting programs the format transmitted when the Auto Format Type is set to Auto.F. A string of up to 20 characters can be entered. Each ASCII character is either a literal ASCII printed character like 065 ('A') or a special token character like 202 (123.4) which sends the gross weight. ASCII 0 is used to mark the end of the format string. To send an ASCII 0, insert an ASCII 128.

Qualifiers are tokens that do not cause any characters to be transmitted but setup the format of other tokens to follow.

For example, the following format string would transmit the weight reading in a fixed 7 character field with leading zero suppression and no decimal point:

172 184 188 200

Following is a table of all of the format tokens.

Qualifier Tokens		
ASCII	**Token**	**Comment**
170	5 character field	
171	6 character field	
172	7 character field	
173	8 character field	Default
174	9 character field	
179	No fixed length field for weight data	
180	No sign character sent	
181	Sign character send as ' ' for positive and '-' for negative	Default
182	Sign character send as '+' for positive and '-' for negative	
183	Sign character send as '0' for positive and '-' for negative	
184	No decimal point sent	
185	DP sent as '.'	Default
186	DP sent as ','	
187	Weight sent with leading zeros, eg 000123	
188	Weight sent without leading zeros eg 123	Default
189	Weight readings sent regardless of overload or error status	Default
190	Weight data blanked on error	
191	Weight data send as '---' on error	
192	Status characters are upper case	Default
193	Status characters are lower case	
Tokens for weight data transmission		
ASCII	**Token**	**Comment**
200	Selected Weight (SRC)	
201	Displayed Weight	
202	Gross Weight	
203	Net Weight	
204	Tare Weight	
205	Total	
206	Displayed String including user prompts etc.	

207	Number of Pieces in counting mode	

Following are tokens for weight status		
ASCII	**Token**	**Comment**
210	Units	‘kg’,’lb’,’ t’,’ g’
211	G,N,E,O,U,M	Standard Ranger status
212	G,N,E,O,U	Ranger status without motion
213	G,N	Gross, Net only
214	M,’ ‘	Motion or ‘ ‘ for stable
215	M,S	Motion or stable
216	‘ ‘, or units	‘ ‘ for motion or weight units
217	M,C,’ ‘	Motion, over-capacity or valid weight
218	M,I,O,’ ‘	Motion, invalid, over-capacity, or valid weight
219	I,O,U	Inscale, overload, underload
220	Z,’ ‘	Centre of Zero
221	‘ ‘,1,2	Single range or range/interval 1or2
222	ST,US,OL	Stable, unstable, overload
223	GS,NT	Gross, Net
230	Send time	Hh:mm:ss
231	Send Date	Dd/mm/yyyy

9.2. Networking the 5100

The standard **5100** protocol supports two levels of networking: **Basic** and **Extended**. The **Basic** level allows for simple weight acquisition by a PLC or computer from a number of **5100s** on a simple RS232 or RS422 network. The **Extended** network language allows for full control over all functions of the instrument. The section here describes only the **Basic** command structure. The **Extended** structure is described in the Communications manual. In addition to the standard protocol the **5100** also supports the industry standard MODBUS ASCII protocol. Details of this protocol may be found in the MODBUS Communications Manual.

Basic Commands

The **5100** may be configured to respond to commands received via the serial port from a PLC or PC. The serial setup (SERIAL:SER1) must be configured to NET, and the network type (SERIAL:NET.OPT:TYPE) set to NET.A. In addition, the address of the **5100** must be set from the SERIAL:NET.OPT:ADDRESS item.

The command structure for basic networking is:

STX - “K” - (Command) - POLL - ETX

where

“K”	is ASCII upper case letter K (ASCII 75)
POLL	is two digits giving this unit’s network address. E.g. ‘01’ for address 1
Command	is a single character from the list below

Nine commands are supported at the basic level of networking. The commands are as follows:

“z”	Simulate **ZERO** key operation ('Z' for long press)
“t"	Simulate **TARE** key operation ('T' for long press)
“g”	Simulate **GROSS/NET** key operation

"P"	Simulate **PRINT** key operation
"p"	Print to network port (Serial port 1). This triggers the transmission of the current weight using the format as set in the Auto format type (SERIAL:AUTO.OPT:TYPE) item.
"q"	Simulate **PRINT** key operation. ('Q' = Print long press)
"f"	Simulate **FUNCTION** key operation. ('F' = Function long press).

Extended commands are available to trigger the extended remote functions normally implemented with external keys. The extended commands are:

"r"	Start, ("R" = Start long press)
"a"	Pause ("A" = Abort)
"B"	Batch
"D"	Dump Enable
"M"	Auto/Manual
"S"	Show Total
"C"	Clear Total
"U"	Undo Last Print
"1"	Single Transmit Serial 1
"2"	Single Transmit Serial 2
"H"	Toggle display hold/normal weighing
'e'	Show Peak weight reading ("E" = clear peak weight reading)
'l'	Livestock hold/retry ("L" = livestock auto/manual select)
'o'	Count ("O" = Acquire sample)

RS422/485 Termination Resistors

The termination resistors required by RS422 and RS485 networks are built into the **5100**. The resistors are used to terminate the ends of the network to provide a balanced loading. The termination resistors in the **5100** are enabled the Bits setting (SERIAL:BITS) of the Digital Setup.

9.3. Printer Driving

The **5100** supports a range of printing facilities, including:
Batch Printing, Manual Printing, Automatic Printing,
Manual/Automatic Totalising and Printing

Printer Modes

Printing may be initiated by the user pressing the Print Key. The **5100** may also be set to autoprinting, which triggers an output when the scale reaches *no motion* with a weight above the *preset zero dead band*. Use the mode item (SERIAL:PRN.OPT:MODE) to set the printing mode.

Total Ticket Printing

To enable totalising, select "Total" or "A.Total" from the Printer Mode Menu (SERIAL:PRN.OPT:MODE) (Section 7.5 p26).

Each press of the Print Key causes a single printout of the current weight which is added to the total weight. Choose the format of these individual printouts from the Printer TYPE menu. Select NONE if the individual weights are not to be printed at all. When all of the items have been weighed press the Print Key for 2 seconds to print and clear the total. See Section 11 on page 66 for extended totalising functions using external keys or the function key.

An example of a total printed ticket is shown below:

```
000491  01/01/1999 10:35:08      100.2 kg G
000492  01/01/1999 10:35:08      105.7 kg G
000493  01/01/1999 10:35:08      124.9 kg G
REC 05
ITEMS:  3    TOTAL:   330.8 kg
```

Printer Output Formats

A range of printer formats can be selected from the SERIAL:PRN.OPT:TYPE item. Below are descriptions of the four available formats.

No Printout (NONE)

This option disables printing of individual weights in a total. The total weight however is still printed.

The Single Line Printout (SING)

A single line printout is intended to produce the most compact printout. The printout is shown in the example below:

```
000024 02/03/2000 16:27:31    150.0 kg G
```

ID Date Time Weight Units Status

Each item is described below:

ID	The ID is a 6 digit sequential counter that is incremented with every printout up to a maximum of 999999 before cycling back to 0. This counter is stored in battery backed memory. It is not directly available for the operator to change.
Time/Date	Current time and date
Weight	The displayed weight
Units	The units of measure set in the scale build
Status	The type of weight reading (Gross/Net)

Double Spaced Printout (DOUB)

A double spaced printout contains the same information as the single line printout above, however the printout is spread over two lines.

Example:

```
000026 02/03/2000 16:31:31
                  150.0 kg G
```

Full Printed Ticket (TIC)

The Full Printed Ticket produces a full ticket-style printout containing all the weight parameters and includes the date and time. Provision has been made for a user configurable two line header at the top of the ticket.

The ticket format can be modified via the ticket format menu (SERIAL:PRN.OPT:TIC.FMT). The default printed ticket is as shown below. This is the format used if there is no custom ticket format entered.

```
      WEIGHT
      TICKET
05/10/1999  16:50:12
ID: 000008    REC 05
T:             654 kg
G:            3654 kg
N:            3000 kg
```

Printer Space

It is possible to specify the number of columns and rows of space to leave around each printout. This allows each printout to be separated from the next by a number of rows of whitespace and the printouts may be centered on the page. The space data is entered as cc.rr, where cc is the number of columns and rr is the number of rows of space. The printer space can be set from Margin Space (SERIAL:PRN.OPT:SPACE) menu item.

Custom Ticket Headers

The 2 lines of 20 characters at the top of the printed ticket can be edited to provide custom headers including such items as company names and phone numbers. These can be edited from the Header item (SERIAL:PRN.OUT: HEADER).

Example: The following table shows the coded entry for “JOE’S FRUIT & VEG”. The ‘J’ would be entered as 1.08.074 for line 1, column 8, ASCII Code 74.

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
1								J	O	E	‘	S								
	32	32	32	32	32	32	32	74	79	69	39	83	32	32	32	32	32	32	32	32
2				F	R	U	I	T		&		V	E	G						
	32	32	32	70	82	85	73	84	32	38	32	86	69	71	32	32	32	32	32	32

Custom Ticket Format

Up to 50 characters of ticket format information can be entered to define the exact style of ticket printout. The ticket can be configured from the Ticket Format item (SERIAL:PRN.OPT:TIC.FMT).

Enter NULL (ASCII 00) as the last character in the string. When the message is complete use the **[OK]** key to return to the menus. Each format character can be a literal ASCII code (e.g. 065 for ‘A’) or a special format character (e.g. 132 for \D for a time/date field).

The following table shows the available format characters. These same format characters may be sent in a temporary weight string via the network communications to define the format of a single printout.

ASCII Code	Escape Sequence	Effect
128	\.	Print a literal NULL character (NULL can't be entered as 00 as this is used to identify the end of the format string)
129	\A	Print line 1 of custom header only. No CRLF is printed.
130	\B	Print line 2 of custom header only. No CRLF is printed.
131	\C	Print the number of Columns of SPACE specified by the Printer Space settings.
132	\D	Print Date Time field : hh:mm:ss dd:mm:yyy
133	\E	Print End of Line : literally prints CRLF (ASCII 013, 010)
134	\F	Same as "\E\C". End of line followed by column space for next line.
135	\G	Print Gross Weight : "weight(7) units(3) G"
136	\H	Print Custom Ticket Header
137	\I	Print ID number
138	\J	Print Reference Number (Not printed if Reference = 0)
139	\K	Current Recipe ID (6 character recipe name)
140	\L	Current Recipe Number
142	\N	Print Net Weight : "weight(7) units(3) N"
143	\O	Print Total Weight : "weight(7) units(3) G"
144	\P	Print number of pieces in counting mode.
146	\R	Print the number of Rows of SPACE specified by the Printer Space settings.
148	\T	Print TARE weight: "weight(7) units(3) T (or PT if pre-set Tare active)
149	\U	Print units
151	\W	Print displayed weight. "weight(7) units(3) G (or N)
155	\+	Print displayed weight as with \W but add weight to total.
156	\-	Undo last \+ operation.

Example: The following table shows the coded entry for a custom ticket. The header is the same as the example custom ticket header entered above.

No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Code	\H	I	D	:	\I	\E	\D	\E					\N	\E	\E	*End*
ASCII	136	073	068	058	137	133	132	133	32	32	32	32	128	133	133	00

The printout from this configuration is shown below:

```
     JOE'S
    FRUIT & VEG
ID: 000005
01/01/1999 10:25:30
     25.5  kg N
```

The following table shows the ASCII codes for control and printable characters.

Code	Char	Code	Char	Code	Char	Code	Char	Code	Char
000	NULL	026	SUB	052	'4'	078	'N'	104	'h'
001	SOH	027	ESC	053	'5'	079	'O'	105	'i'
002	STX	028	FS	054	'6'	080	'P'	106	'j'
003	ETX	029	GS	055	'7'	081	'Q'	107	'k'
004	EOT	030	RS	056	'8'	082	'R'	108	'l'
005	ENQ	031	US	057	'9'	083	'S'	109	'm'
006	ACK	032	' ' (space)	058	':'	084	'T'	110	'n'
007	BEL	033	'!'	059	';'	085	'U'	111	'o'
008	BS	034	'"'	060	'<'	086	'V'	112	'p'
009	HT	035	'#'	061	'='	087	'W'	113	'q'
010	LF	036	'$'	062	'>'	088	'X'	114	'r'
011	VT	037	'%'	063	'?'	089	'Y'	115	's'
012	FF	038	'&'	064	'@'	090	'Z'	116	't'
013	CR	039	'''	065	'A'	091	'['	117	'u'
014	SO	040	'('	066	'B'	092	'\'	118	'v'
015	SI	041	')'	067	'C'	093	']'	119	'w'
016	DLE	042	'*'	068	'D'	094	'^'	120	'x'
017	DC1	043	'+'	069	'E'	095	'_'	121	'y'
018	DC2	044	','	070	'F'	096	'`'	122	'z'
019	DC3	045	'-'	071	'G'	097	'a'	123	'{'
020	DC4	046	'.'	072	'H'	098	'b'	124	'|'
021	NAK	047	'/'	073	'I'	099	'c'	125	'}'
022	SYN	048	'0'	074	'J'	100	'd'	126	'~'
023	ETB	049	'1'	075	'K'	101	'e'	127	DEL
024	CAN	050	'2'	076	'L'	102	'f'		
025	EM	051	'3'	077	'M'	103	'g'		

Printer Control

Most printers use embedded control characters to specify different fonts, colors and paper cutting. Consult your printer manual for details of these control characters. Enter the control characters directly into the printer ticket format string to create the desired printing effects.

9.4. PLC Output Driving

The **5100** will drive relay outputs on two low cost PLCs, via either of the serial ports. When either PLCA or PLCB are selected from the serial options (SERIAL:SER1, SERIAL:SER2), the serial bit format (SERIAL:BITS) is forced to the required PLC format. For further information on the PLC outputs refer to Section 10.9 (Page 65).

10. SETPOINTS

The **5100** is capable of working with 25 internal setpoints. The status of the first 6 of these setpoints is displayed on the LCD. Each setpoint can be configured to perform a particular function and may be associated with a physical output driver or simply used to keep track of multiple materials in a manual filling process where only a generic 'Fill' setpoint is connected to a physical driver. The 5100 can drive 2, 4 or 6 outputs internally depending on which option cards are fitted. If the **5100** is connected serially to a slave PLC, 6, 14 or 22 outputs can be driven externally. It is possible to purchase from Rinstrum pre-programmed PLCs which connect directly to the **5100** and provide these output drivers as well as manual override and emergency stop functions.

The **5100** stores information for up to 99 different recipes. Each recipe has it's own 6 digit alphanumeric ID and contains target information for each of the 25 possible setpoints. In-flight and Tolerance settings are stored globally for each of the setpoints and the same settings are used for each recipe. Each recipe can also have a preset tare value associated with it to enable re-filling of partially full vessels (e.g. gas bottles).

The batching process involves the selection of a recipe to batch. The recipe may be found by searching for its ID. The recipe can be further modified by selecting a batch proportion. This defaults to 100.0% but may be set from 0.1% to 1000.0%. In this way it is possible to store a recipe for a standard quantity of product (say $1m^3$ of concrete) and actually batch multiples of this recipe. (i.e 300.0% would batch $3m^3$).

All of the operating parameters for the batching process are available from the front panel, and may be altered while a batch in running without interfering with the current batch.

10.1. Connection

Refer to Section 12: ACCESSORIES AND OPTIONS on page 69 for the method of connection of the external output drivers.

10.2. Basic Setpoint Operation

In order to use a batching system, it must first be configured from the Digital Setup menus, under the Setpoints group (SET.PTS). Once the configuration has been performed, all operator parameters like targets and flight settings are entered from the operator menus directly without requiring access to the setup menus. See Section 5.3 on page 15 for information on operator access.

The following sections describe each of the available setpoint settings.

(DEFLT) Configure using Default Applications

To aid setting up the **5100** it is possible to pre-configure the setpoints for a range of standard application defaults. The pre-configured options are not fixed, they simply fill in the setpoint types (SET.PTS:SET.TYP) automatically. It is then possible to modify the standard configuration to suit a particular application.
Once the Default option is selected you will be prompted with CLR?. Select 'n' to leave all other settings unchanged or 'Y' to clear all of the setpoint settings including material names, general options, usage logs and batch statistics.

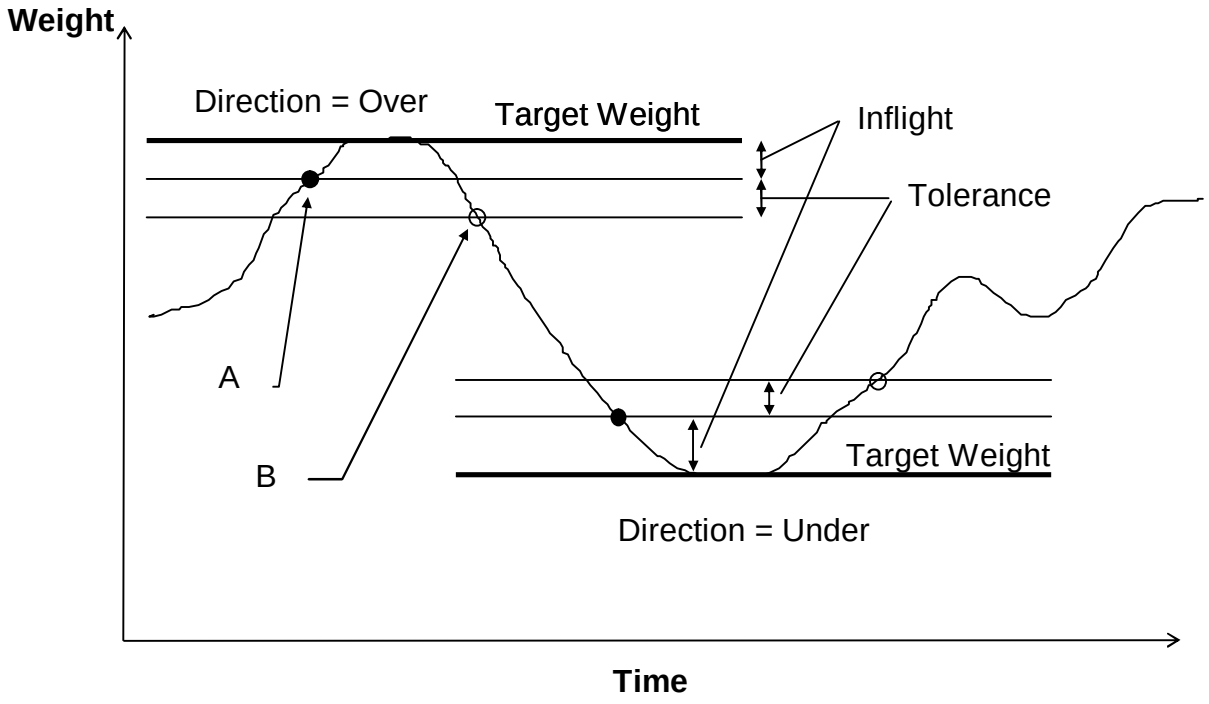
Following is a list of the pre-configuration options:

Option	Description	Outputs
NONE	No setpoints defined	No outputs.
MT1.SP1	One Material single speed + dump	1: MAT1, 4: DUMP
MT1.SP2	One Material dual speed + dump	1: MAT1 slow, 2: MAT1 fast, 4: DUMP
MT1.SP3	One Material triple speed + dump	1: MAT1 slow, 2: MAT1 medium, 3: MAT1 fast, 4: DUMP
MT2.SP1	Two Material single speed + dump	1: MAT1, 2: MAT2 ,4: DUMP
MT2.SP2	Two Material dual speed + dump	1: MAT1 slow, 2: MAT1 fast 3: MAT2 slow, 4: MAT2 fast 6: DUMP
MT4.SP1	Four Material single speed + dump	1: MAT1 … 4: MAT4, 6: DUMP
MT6.SP1	Six Materials single speed + dump	1: MAT1…6: MAT6, 7: DUMP
MT10.SP1	Ten Materials single speed + dump	1: MAT1…10: MAT10 11: DUMP
MT20.SP1	Twenty Materials single speed + dump	1: MAT1…20: MAT20 21: DUMP
MT10.MAN	10 Material manual feed	1: Filling, 2: Paused,3: Tolerance 5: MAT1…14: MAT10
MT20.MAN	20 Material manual feed	1: Filling, 2: Paused, 3: Tolerance 5: MAT1 …24: MAT20
TOTAL	Single material with dump + total material control	1: TOTAL, 2: MAT1 4: DUMP

(SET.TYP) Configuring a Setpoint

Setpoints define outputs that are activated when certain conditions are met. The setpoint type defines the conditions to be met to activate the output. Material and active setpoints are based on weight, whilst others are used to control sequences and indicate conditions within the **5100** such as overload.

The operation of material and active weight setpoints is demonstrated in the diagram below. Also illustrated are the roles of target, flight and tolerance settings.



Active Setpoints: Note the difference between Over and Under directions.

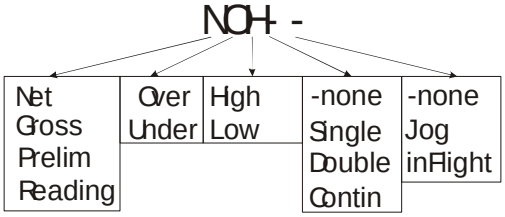
If the Logic is set to ‘High’ the output is turned on at point ‘A‘ and off again at point ‘B’.

If the Logic is set to ‘Low’ the output is turned off at point ‘A’ and on again at point ‘B’.

For 'Over' setpoints the switch point is the target weight minus the inflight. With 'Under' setpoints the switch point is the target weight plus the inflight. Similar differences apply to the role of the tolerance setting.

Setpoint Options

To increase flexibility of the setpointing system, a number of options are available for each type of setpoint. These options are set using an option entry item. After selecting the setpoint type, the options available for the particular setpoint are displayed, and can be configured. A description of all options is given below. Note that not all options are available for all setpoints. The individual setpoint descriptions detail which options are available for that setpoint.



Source (Gross, Net, Prelim): Select whether this setpoint uses gross weight, net weight, is a fast feeder for a preliminary target, or uses displayed weight. When filling, Preliminary targets use the same weight source as the primary target. Use prelim for multi-speed filling. Use a Gross Source to switch the indicator into gross mode at the start of the sequence and fill to a gross weight target. With the Net Source the indicator performs a Tare operation (or uses the recipe preset tare if available for the first material) at the start of a sequence and weighs to a net weight target. The Reading Source does not alter the weight reading at the start of the sequence and weighs to a target based on the current displayed reading either gross or net. Use Reading Source if manual operator intervention (like taring etc) before the batch start is to be taken into account.

Direction (Over, Under): Choose Over if weight increases towards the setpoint target, otherwise Under for a reduction in weight toward the setpoint. Note that an Under setpoint with a net source requires a negative net weight target to be entered in the operator menus.

Logic Level (High, Low): This option determines the logical sense of the output. Logic High is the normal operation of the output. Consider the example of an overload alarm where the output is ON for weights over the target value and OFF otherwise. This corresponds to Logic High operation. Logic Low reverses the operation of the output so it would be ON below the target and OFF above it. Logic selection is only available with the ACTIVE setpoint type. Other setpoint types have the logic determined automatically.

Alarm (None, Single, Double, Contin): The alarm setting is use to configure an alarm to activate whilst a setpoint is active. The alarms are in the form of beeps emitted by the **5100**.

Correction (None, Jog, inFlight): The Correction setting enables a number of automatic corrections to be made at the end of a material fill. The Jog option enables the automatic jog sequence to bring the weight to target slowly, for a particular material. Jog times can then be configured for the material in the Jog menu (SET.PTS:JOGS). Automatic inflight adjustment makes a correction at the end of a fill based on the difference between the desired target and the actual weight, so that subsequent batches will be more accurate.

10.3. Setpoint Types and Options (SET.TYP)

Each of the 25 setpoints is assigned a specific type and a number of options. Not all options are available with every type. Below is a list of all of the different setpoint types along with the options available for each. The alarm option is available for all setpoint types.

NONE

This is the default setting and disables the setpoint when not in use. These setpoints may be driven directly via the comms.

ACTIVE

Setpoints of this type are always active regardless of whether a batch is running or not. Active setpoints are applicable to level control and overload alarms, etc. The target for an active setpoint can be set from the LIM item(s) which appear in the Operator Target menu.

The options applicable to active setpoints are as follows:

- Source
- Direction
- Logic Level

TOTAL

A total setpoint is used to allow the **5100** to run multiple batches in combination to reach a total batch weight. The individual tip weights are specified by the material target and the Total batch weight is specified by the total setpoint target weight. An output associated with the Total setpoint can be used for a final slow speed feed to finish the overall batch. The inflight setting of the total setpoint specifies the amount of material filled by this final feed.

A number of full weight batches are run until the remaining weight to reach the total is less than twice a normal batch tip. The final two batch tips are adjusted to meet the total target weight less the final dribble feed if specified. If jogging is specified for the material filling then the final dribble feed from the Total Setpoint is jogged not the material tip output as the accuracy of an individual tip is not important.

The target for a total setpoint can be set from the TOTAL item which appears in the operator Target menu.

DUMP

This specifies a dump sequence is to be enabled once all material filling is finished. When active, a dump sequence energises this setpoint until the weight returns to a value within the zero dead band or negative and there is no motion, at which point the batching process is finished.

If the source option is set to GROSS the **5100** is returned to Gross mode during this process, otherwise the **5100** remains unchanged.

FINISH

This setpoint will be energised for the time entered in the FINISH item (SET.PTS:DELAY:FINISH). This finish pulse is generated after all the material filling and delay sequences have finished. The FINISH setpoint is used for external system synchronisation or for dumping in situations where a dump pulse is required rather than a 'dump to weight' sequence. After the finish pulse has completed and the output has turned off this sequence waits for no motion and for the dump gate interlock signal to be energised if used.

If the source option is set to GROSS the **5100** is returned to Gross mode at the end of the batch, otherwise the **5100** remains unchanged.

FILL

This is a status output that is energised whenever the **5100** is performing a fill with a material. For manual filling operations this allows many materials to be controlled without the need to wire up automatic feeders for each one. One physical output can therefore be used to fill up to 20 materials with manual intervention for material selection.

TOL

This is a status output that is cleared at the beginning of a batch and is energised if an 'out of tolerance' condition is detected for any material filling operation. The tolerances for each material can be set from the Operator Flight menu.

RUN

This is a status output that is energised whenever the **5100** is running a batch. It is off if the batch is paused.

PAUSE

This is a status output that is energised whenever the **5100** is paused. The output is energised for 0.5 seconds every 5 seconds to allow an external siren to be connected to warn the operator that the unit is paused.

WAIT

This is a status output that is energised when the **5100** is waiting for a 'dump enable' signal to continue with the dump process. If this setpoint is enabled, an input must be configured for ‘dump enable’. Refer to Section 10.6 (Page 62) for information on configuring a ‘dump enable’ input.

ERROR

This is a status output that is normally energised and is turned off when the **5100** detects an operation error like a broken loadcell cable.

MOTION

This is a status output that is energised whenever the **5100** detects motion in the weight reading.

ZERO

This is a status output that is energised whenever the weight reading is within the zero dead band. If the 5100 is operating in Trade Mode and the zero dead band is set to zero then this output follows the 'Centre of Zero' annunciator.

MAT.1 .. MAT.20

These are the material fill setpoints. There are 20 different materials that a setpoint may be configured to fill. Each setpoint controls a single output. In order to implement multiple speed filling of a particular material, configure a number of setpoints to the same material, and configure all but one as preliminary setpoints.

The options applicable to material setpoints are as follows:

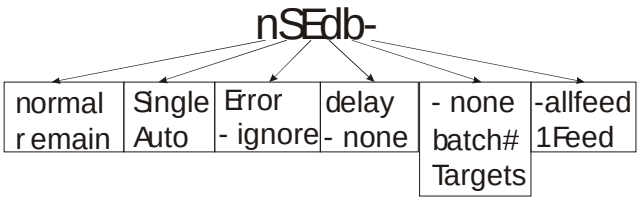
- Source
- Direction
- Correction

10.4. General Configuration

(GEN.OPT) General Batching Options

(OPTION) Batching Options

Batching options are items that affect the entire batching process and are not specific to a particular setpoint type. The figure below shows the available options for each of the items in the batching option entry.



The following is a description of each of the batching options:

n, r 'n' specifies normal weights are displayed during the batching process. 'r' forces the display of remaining weight to target instead. The 'r' setting is particularly useful for manual filling, as the operator does not need to know the target weight.

S, A ‘S‘ specifies a single batch resulting from each START key press. ‘A’ causes an automatic restart at the end of each batch so that the first press of the START key starts a continuous batching process. A long press of a Pause or Batch key can be used to abort the automatic restarting process.

E, - ‘E’ specifies that batching is to be paused whenever Overload, Underload or Error is detected. ‘-‘ allows the batching process to continue regardless.

d, - ‘d’ enables an additional one second delay at the start of the filling and dump processes. This allows the operator to easily see final weights and the results of automatic tare operations, etc. Set to ‘-‘ to remove the delay and hence increase batching speed.

-,b,t ‘t’ specifies that the current batch number and material targets be shown at the start of each batch. 'b' displays the current batch number etc only. Set to ‘-‘ to prevent this display and increase batching speed.

-, F This setting specifies the type of feeder control. ‘F’ only allows one feeder at a time to be active for a particular material, whilst ‘-‘ allows all the feeders for a material to be active at the same time.

(FLT.ADJ) In-flight Adjustment

The in-flight adjustment sets the percentage of filling error that may be used to correct the in-flight value. This can be set from 0% to 100%. Larger values of adjustment rapidly remove any errors but make the system more susceptible to overshoot and hunting.

To further limit the effect of any one batch, in-flight values cannot be adjusted by any more than 50% of its' current value, regardless of the size of the error.

The following example demonstrates the operation of automatic in-flight adjustment:

Given the following settings:

Target = 100kg, In-flight = 10 kg, In-flight adjustment = 25%

Suppose product filling finishes with a final weight of 96kg giving an error of -4 kg. The 25% in-flight adjustment gives an adjustment of -1 kg, which brings the in-flight value to 9 kg.

This setting effects only material setpoints that have their correction option configured for automatic in-flight adjustment.

(TOL) Tolerance Setting

At the end of a filling sequence the final weight is compared to the original target weight. If the filling error is too great, the batch is marked as out of tolerance. The tolerance setting specifies an action to be taken in this situation. Options for this setting are:

- NONE: No response other than setting the 'out-of-tolerance' condition for the batch.
- BEEP: Sounds buzzer and continues
- PAUSE: Pause operation

(AUT.CLR) Automatic Clear Options

With this option it is possible to automatically clear certain settings back to defaults at the end of the batch. Options are:

- NONE: No automatic clearing.
- PROP: Set proportion back to 100%.
- REC.1: Clear all target settings for Recipe 1.

(PROP.PC) Proportion Percentage

If set to ON this option specifies that proportions are entered as percentages with 100% being the nominated target weights. If OFF proportions are entered as a direct ratio (eg 3.0 being 3 times nominal target settings).

(LABEL) Labels

A six character label is available for each of the 20 materials. This label is used to identify the material on printouts and display. The names default to 'MAT 1' to 'MAT 20' but may be changed to any alphanumeric string. The labels list (SET.PTS:LABEL) only shows the materials selected in the setpoint types (SET.PTS:SET.TYP). Thus, if your system only uses two materials then only the labels for these two are available to edit.

(DELAY) Delay Settings

A number of delay settings are available to control the speed of the batching process. These delays allow for material settling and make it easier to follow the operation of the batching process. The different delay types are described below:

(DELAY1..DLY20) Delays 1..20

Each of the materials selected in the setpoint type item (SET.PTS:SET.TYP) has an adjustable delay setting which controls the time delay at the end of the filling process. The time delay may be set from 0.1 to 20.0 seconds. It is also possible to set the delay to 0.0 seconds which forces the program to pause and wait for the operator to resume the rest of the batch. Delay settings are only available for material setpoints that have been defined.

(FINISH) Finish Delay

Setpoints defined as a 'Finish' activity are energised for the amount of time specified by this setting. The finish delay may be set from 0.0 to 20.0 seconds. These outputs may be used to trigger external processes, alarms or as a direct dump process instead of using usual the 'dump to weight' process. The finish delay setting is only available if a finish setpoint has been defined in the setpoint type item (SET.PTS:SET.TYP).

(JOG) Auto Jogging

Materials that do not flow smoothly are difficult to control accurately using auto in-flight adjustments. With automatic jogging, the material is filled to the target less the in-flight weight and the final target is reached through a series of 'jogs'. The material setpoint output of the **5100** is energised for a set amount of time and is held off for a set amount of time. A number of jog operations are performed in a set before the weight is allowed to stabilise. This process is repeated until the target weight is reached. To enable jogging for a particular material, the correction must be set to 'jogging' from the setpoint type (SET.PTS:SET.TYP) menu and the amount of material to be jogged must be set via the inflight weight.

(JOG1..JOG20) Jogs 1..*20*

Each of the material setpoints has a jog on-time associated with it. This time delay is set in 0.1 second increments and specifies how long the output is energised during each jog.

(JOG.OFF) Jog Off time

This specifies the amount of time the output is off between each jog in a set.

(JOG.SET) Number of Jogs per Set

This specifies the number of jogs that are performed before the instrument waits for the weight reading to settle.

10.5. Operator Parameters

The operating parameters for batching control are not available directly through the setup menus. Use the SET key to access the operator menus when not in the setup menus. See Section 5.3 on page 15 for information on how to use the operator menus.

Targets

This is the target weight value. The **5100** calculates a trip point based on the values of target, flight and the direction of operation. For increasing weights (Over) the trip point is the target value minus the flight compensation. For decreasing weights (Under) the trip point is the target value plus the flight compensation.

Targets may be entered as positive or negative values. Usually when weighing out of a hopper the targets are set as negative net weights.

Flights

Preliminary Targets: For applications using multiple speed feeders it is convenient to specify the target values for the fast feeders in terms of the 'weight before target' instead of the absolute target weight. For example, to fill 1000 kg with 800 kg of fast fill, specify the target weight as 1000 kg and the preliminary weight as 200 kg. This then allows the final target to be changed without the need to change the interim targets.

In-flight: In-flight compensation is used in weigh-batching installations to force the feeders to shut off early to allow for the amount of material still in flight between the feeder gate and the surface of material already in the weigh-bin. This value is initially set by the operator.

It is possible to have the in-flight settings automatically updated at the end of each batch to track out any errors.

In addition the 5100 can be configured to automatically jog the weight up to target. The amount of weight left to be jogged is specified by the in-flight setting.

Tolerance/Hysteresis: The tolerance/hysteresis value forces a preset margin in the trip point. This stops the output from ‘chattering’ due to minor weight fluctuations at the trip point value. For increasing weights (Over) the hysteresis is used below the trip point and for decreasing weights (Under) it is used above the trip point.

This same value is used at the end of a fill sequence to check if the final weight is close enough to target.

10.6. Function Key, External Keys and Interlock

To control the batching process it is necessary to configure either the function key or some of the external inputs available on the setpoint card to the following functions:

Start: This is used to start the batching process or restart it if paused.

Pause/Abort: This key will pause the batching process. A long press of the key will abort the batch completely. To re-start press the start key.

Batch: Use this function to combine the start/pause/abort functions into a single key. A single press will start the batch or pause a running batch. A long press will abort the batch.

Interlock: An interlock input is used to indicate that the dump gate is closed and it is safe to start filling product. If during the filling process, the interlock signal is lost the batching process is paused and the filling is stopped. Obviously this signal is ignored during the dump process. Do not allocate any of the inputs to this function if you do not wish to use interlocking.

Dump Enable: The dumping process is delayed until a dump enable signal is detected. This signal may be detected anytime after the batch has started. This is used to signal to the batching process that it is ok to proceed with the dumping process as conditions downstream are prepared to accept the product. If no inputs are assigned to this function it is assumed that the dumping process is cleared to proceed at all times.

Manual: This key toggles between manual and automatic filling. With manual filling 'MAN' is displayed on the auxiliary display instead of the current recipe and the filling process is controlled by the JOG key instead of the target weight settings. This enables a complete batch to be run manually with full printing and material logging without the need to enter target values for the materials. At the end of each material press the BATCH or START keys to move onto the next material or dump sequence etc.

Jog: In manual operation the JOG key is used to control material filling. Press the JOG key to fill material and press the BATCH or START keys to move on to the next material.

Manual Dump: A Manual Dump function works in conjunction with dump setpoints to modify the normal automatic dumping function. If used the Manual Dump function causes the dump sequence to pause and wait for the Manual Dump input to be activated before proceeding with the dump.

In addition the Manual Dump input causes the dump outputs to be activated if there is no batch running. This allows an operator to manually open dump gates etc before starting a batch.

Recipe Selection R.SEL1 .. R.SEL4: Recipe Selection inputs override the normal keypad or communications selection of the current recipe. When used these inputs directly set the current recipe and can be used with simple toggle switches, BCD or HEX thumbwheels, rotary switches or PLC outputs. Multiple **5100** units can all be switched to the same recipe by connecting the R.SEL inputs of all units to the same selector switches.

The R.SEL inputs work in a simple binary fashion according to the following table. It is not necessary to use all 4 inputs if fewer than 16 recipes are needed. R.SEL1 allows for 2 recipes, RSEL1&2 allows for 4, RSEL1..3 allows for 8 and RSEL1..4 allows for 16. When all RSEL inputs are off the recipe can be set using the front keypad or serial interface.

R.SEL4	R.SEL3	R.SEL2	R.SEL1	Recipe Selection
OFF	OFF	OFF	OFF	Keypad Selection
OFF	OFF	OFF	ON	1
OFF	OFF	ON	OFF	2
OFF	OFF	ON	ON	3
OFF	ON	OFF	OFF	4
OFF	ON	OFF	ON	5
OFF	ON	ON	OFF	6
OFF	ON	ON	ON	7
ON	OFF	OFF	OFF	8
ON	OFF	OFF	ON	9
ON	OFF	ON	OFF	10
ON	OFF	ON	ON	11
ON	ON	OFF	OFF	12
ON	ON	OFF	ON	13
ON	ON	ON	OFF	14
ON	ON	ON	ON	15

10.7. Setpoint Messages

A number of messages are used throughout the batching process. These messages are listed below:

READY: This is displayed every 5 seconds at the end of the batch to indicate that the batch is finished and the instrument is waiting for another batch to be started.

DUMP: This is displayed if the dump process is ready to begin but a Dump Enable signal has not been received yet.

PAUSE OPER: This is displayed every 5 seconds to indicate that the batch has been paused by the operator.

PAUSE OL, PAUSE UL, PAUSE ER: This message indicates that the batch has been paused due to overload (OL), underload (UL) or Error (ER) detection.

PAUSE TOL: This message indicates that the batch has been paused because the filling error in the last material filled is outside tolerance.

PAUSE I.LOC: This message indicates that the batch is paused due to the loss of the interlock signal during the filling of a material.

PAUSE PROG: This message indicates that the batch is paused due to a programmed pause step enabled by entering 0.0 seconds for a material delay.

NO TARGET: This message indicates that the batch has not started due to the fact that there are no target weights entered for this recipe.

10.8. Setpoint Printing

When the **5100** is operating as a batching controller there are there are 5 different printing formats to choose from:

NONE: No printing is done during the batch process at all. Use this option if you only want to produce batch statistics and material log reports.

SINGLE/DOUBLE: 80 column printing with a single header for each 20 lines of batch printout. Up to 4 materials (including batch total) may be printed per line. SINGLE mode tries to fit as many materials as possible per line by not printing target information if more than 2 materials are being used. Double prints material name, target and weight information with 2 materials per line.

TICKET: 40 column ticket printout with header information printed with every batch. Use this mode to a print batch docket per batch. One material is printed per line.

CUSTOM: This mode suppresses all fixed format printing during a batch. The custom ticket format string is used o define a single printout that is triggered directly before the end of a batch (just before the dump sequence). This allows complete control over the ticket appearance but only the total weight on the scale at the end of the batch is available.

With SINGLE/DOUBLE and TICKET the custom ticket format string is used at the end of a printing sequence (usually 20 lines or whenever recipes are changed etc) to allow printer control characters to be entered for paper cutting etc.

With all modes it is possible to force a printer form feed whenever a header is printed. To do this set the SPACE ROWS to 10. A setting of 1..9 inserts 1..9 lines of space before the header and a setting of 10 forces a form feed.

Batch printouts contain target and actual weight information. So if you are filling to a target of 100kg net followed by a topup to 150kg reading, the printout will reflect the 100kg and 150kg targets but the batch target will correctly recognise the true batch total and target of 150kg. The material log and batch statistics will note the actual amounts of material filled (eg 100kg of material 1 and 50kg of material 2) not the target weights achieved.

To setup for setpoint printing set the SER2 item to ‘Print’ and set the MODE item in the Prn.OPT subgroup to ‘MANUAL’. Automatic printing generates printouts of the current weight whenever the weight reading settles and is not recommended for use with setpointing. Information is printed at the start of the batch, and at the end of filling for each product.

It is also possible to set SERIAL 2 up for other funcitons and still retain printing capabilities. All printouts are buffered in an internal 1kbyte buffer which is accessible using the PRT?1 query from RangerNet. In this way, with a PC or PLC comms link to Serial 1 the printed information normally sent to a printer on Serial 2 can be requested from Serial 1.

BATCH STATISTICS and MATERIAL LOG

Press and hold the '1' or '2' keys for 2 seconds to enter the stats or log display. Continue to press '1', '2' SEL etc to view batch statistics and material log. A single press of the Print key prints all batch information or all log information in a single table. Press and hold the print key to print and clear. You will be prompted to make sure you want to clear and the 5100 will display 'PRINT' while waiting for the printer to ensure the printout is successful before clearing any information. If the printout is not successful the data will not be cleared.

10.9. PLC Output Module

The **5100** offers direct support for two low cost PLCs. These are intended to be used as extended output modules. The **5100** communicates directly with the PLC via its onboard programming port. The PLCs are supplied from Rinstrum preloaded with safety interlock and manual override logic installed. These ladder logic programs are freely available and may be altered to suit specific applications if desired.

To use a PLC it is necessary to select PLCA or PLCB from the SER1 or SER2 items. It is also necessary to set the baud rate and bits settings to match the PLC.

For information on how to install the PLC consult the Rinstrum Installation manual for the PLC itself.

PLCA is a Mitsubishi PLC with 16 inputs and 14 outputs. The PLC is controlled via a serial cable connected to either SER1 or SER2 of the **5100**. The Baud rate is 9600 and the bits setting is E71 (Even Parity, 7 data bits, 1 stop bit).

PLCB is a NaiS FOP PLC with 8,16 or 24 inputs and 6,14 or 22 outputs depending on which expansion modules are used. The baud rate is 9600 and the bits setting is O81 (Odd Parity, 8 data bits and 1 stop bit). This is the preferred brand of PLC for this application and is the one that Rinstrum is intending to stock and support long term.

11. Extended Functions

11.1. Introduction

The **5100** has up to five independent remote input functions that may be triggered by external keys connected to the optional accessory cards. In addition there is a single general purpose function key on the front panel of the **5100**. The function of each of these keys may can be configured to any of the options detailed below. See Section 7.5 Special Settings Menu - (SPEC) on page 26 for details on how to configure the function key and remote input functions. Not all remote functions are available on the front panel function key. Functions that are only suitable for remote inputs are marked with ® below.

11.2. Extended Function Details

® Front Panel Keys (ZERO,TARE,GR.NET,PRINT)

The function of each of the front panel keys may be implemented with the remote keys.

® Blanking (BLANK)

This function allocates the selected input as a blanking input. When active this input causes the front display to be blanked to "------" and blocks the operation of the front keys. This function is intended for use with tilt sensors on mobile weighing platforms to block operation of the weight indicator if the scale is not level.

® Locking (LOCK)

This function allocates the selected input as a locking input. When active all keys, including the remote keys are blocked. This may be used with a keylock switch to lock the instrument when not in use.

Totalising (SHOW.T, ®CLR.TOT, ®M-)

When Total Printing is enabled, the Print key is used not only to print the current weight but to add that weight to the current total. The **5100** displays "count" followed by the number of items in the total. After this "total" is displayed followed by the current total weight. If the total weight is too large to display in 6 digits, it is shown in two sections labeled as "TOT.HI" for the upper 6 digits and "TOT.LO" for the lower 6 digits. A long press of the Print key causes the total accumulated weight to be printed and then cleared.

Three other functions are available remotely. These are Show Current Total ('SHOW.T'), Clear Total ('CLR.TOT') and undo last print ('M-'). Show Current Total forces the indicator to display the number of items in the total followed by the current total weight. There is no printout. Clear Total prints the current total and clears it. Undo Last subtracts the last item added to the current total and prints "Last Entry Canceled". The Clear Total and M- functions are also implemented on the front keyboard.

Extended Setpointing Batch Control

See Section 10.6 on page 62 for information on the extended batching control functions.

®Single Serial Transmission (SING.1, SING.2)

These functions implement a single transmission of weight data from either of the serial ports. Use ‘Auto.1’ to specify serial port 1 and ‘Auto.2’ for serial port 2. To use this feature it is also necessary to configure the respective serial port for SINGLE operation. See Section 7.5 on page 26 for details.

Each time a single serial key is pressed the unit transmits one weight message from the serial port. The format of the message is setup in the AUT.OPT menus and is exactly the same format as for an equivalent automatic transmission message.

The single serial transmission functions are a convenient way to implement simple PLC communications and logging without the complexity of setting up two way communications on the serial ports.

Hold Functions (Hold,Peak.H)

‘Hold’ implements a manual hold function and 'Peak.H' implements a Peak hold function. The HOLD annunciator is lit to indicate that the displayed weight is a held weight and not the current weight.

Press the manual hold key once to hold the current displayed weight. Press the manual hold key again to return the display to normal weighing.

Press the peak hold key once to show the absolute peak weight reading. Press the peak hold key again to return the display to normal weighing. A long press of the peak hold key clears the peak value back to 0. The largest absolute weight (either positive or negative) is stored in the peak value.

All printouts that print the displayed weight will use the held weight reading if it is currently begin displayed. The single and double line printouts use displayed weight but, the standard ticket format prints gross, net and tare weights regardless of the displayed weight. Use the \w format character to specify displayed weight when using formatted ticket printing.

Live Weight (LIVE.WT)

Use this key to enable 'liveweight averaging'. With this feature it is possible to determine the weight of a continually moving mass. Press and hold this key to switch between normal weighing and 'liveweight' mode.

During normal weighing this key operates exactly like a manual hold key.

In 'liveweight' mode use this key to force a resample of the weight. While the weight is being sampled the **5100** displays '------'. Once a weight has been determined the **5100** beeps to indicate how reliable the reading is. A single beep indicates that the sample is too unreliable and has been discarded. A double beep indicates that the sample is reliable but is made up of a long term average of readings. A triple beep indicates that the sample was taken as a result of no motion and is very reliable.

Counting (COUNT)

Use this key to implement parts counting. Press the count key to switch between weight display and counts display. The units annunciator shows 'p' for pieces.

Press and hold this key to enter the sample quantity. Press again to measure the weight of the sample. At this point it is possible to enter the sample weight directly using the numeric keys or use the weight of the current sample as the sample weight.

Sample weights and quantities are stored separately for each of the 99 recipes. Use these 99 recipes to store names (using the recipe ID) and sample information for up to 99 different products.

12. ACCESSORIES AND OPTIONS

12.1. Introduction

The **5100** can be expanded by the installation of optional accessory cards. Three different cards are available: the analogue output card, the setpoint card and the combo card.

12.2. Installing Option Cards

Isolate the **5100** from the power before attempting to install an accessory card. Avoid excess handling of the accessory card as each card contains static sensitive devices. Hold the card by the edges or mounting plate as much as possible.

Each option card is installed into a slot in the back panel of the **5100**. The slot is accessed by removing the cover plate at the top left. The connector lead is attached to the inside of this plate. Separate the lead from the plate taking care not to lose the lead inside the **5100**. Discard the plate, but retain the two mounting screws. Clean any remnants of tape from the lead connector.

Plug the lead connector onto the four pin socket on the accessory card. The connector only fits one way round.

Slide the card into the slot in the back of the **5100**, cable end first, until the mounting plate is fitted against the back plate. Re-install the two retaining screws.

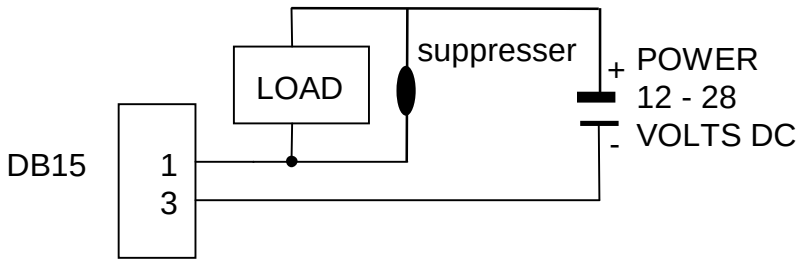
VERY IMPORTANT

The EMC resistance of the accessory card depends on a sound electrical connection between the support plate and the case of the **5100**. Make sure that this connection is as sound as possible when refitting the two retaining screws.

12.3. The Setpoint Card

The standard **5100** displays the results of checkweigh or setpoint function on the front panel annunciator LEDs only. These signals can be used to drive external devices by installing an output driver card. The card carries four independent opto isolated open-collector transistor drivers. These can be used to operate external devices such as relays, signal lamps or PLC inputs. The card also has four opto-isolated remote inputs. The function of each input can be selected. See Section 11 Extended Functions on page 66.

The Output Drivers

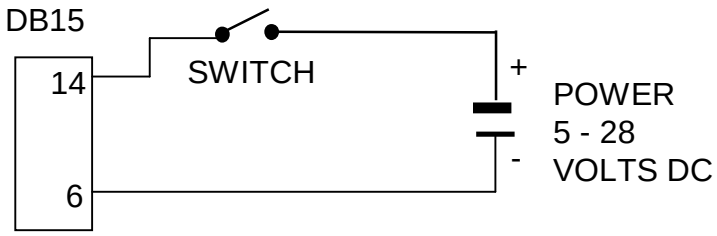


The output stage does not contain a power source and must be powered externally. The external supply should be from 12 to 28 volts DC and the maximum load current must be less than 0.5A .

The circuit diagram above shows a typical connection for one of the outputs. Each driver is protected against electrical noise, but it is strongly recommended that spark suppressors are fitted across any inductive loads such as relay and solenoid coils.

The Remote Inputs

Each input is opto-isolated, and requires a voltage input of between 5 & 28 volts DC to trigger. The following diagram shows a typical input circuit.



The following table shows the connections for the I/O card.

Pin No.	Function	Description	Connect To
1	OUT 1	Output 1	Load 1
9	OUT 2	Output 2	Load 2
2	OUT 3	Output 3	Load 3
10	OUT 4	Output 4	Load 4
3	OUTCOM	Output Common	Output Supply Negative
6	INCOM	Input Common	Input Supply Negative
14	IN 1	Remote Function 1	Contacts 1
7	IN 2	Remote Function 2	Contacts 2
15	IN 3	Remote Function 3	Contacts 3
8	IN 4	Remote Function 4	Contacts 4
SHELL	CH.GND	Chassis Ground	Cable Shield

12.4. The 'Combo' Card

This card provides either a -10 to 10 Volt analogue output or a 4 to 20 mA analogue output. In addition it also provides two outputs and 1 input as per the setpoint card. The outputs are isolated from the input and the analogue outputs. For more information on the connection of the outputs and input see details on the setpoint card above.

The current loop driver is active and supplies the source of power for the loop. The maximum circuit impedance must not exceed 500 ohms. The range of output is extended to include 0 .. 24mA which allows for readings outside 0 .. fullscale to be detected.

The Voltage output can drive into loads down to 2,000 ohms. The voltage output can be used with negative as well as positive weights with 0V representing zero weight and 10 V representing fullscale weight.

Shielded cable should be used for connecting the analogue outputs to external devices.

With the Combo-card either voltage or current output must be selected. It is not possible to drive both simultaneously. Fine adjustment of the analogue output is possible using the Cal.Lo and Cal.Hi options in the analogue menu.

The following table shows the connections for the Multi card.

Pin No.	Function	Description	Connect To
1	OUT 5	Output 5	Load 5
9	OUT 6	Output 6	Load 6
3	OUTCOM	Output Common	Output Supply Negative
6	INCOM	Input Common	Input Supply Negative
14	IN 5	Remote Function 5	Contacts 5
4	V (+)	Voltage Output Positive	Minimum load 2000 ohms
5	I (+)	Current Loop Output	Maximum load 500 ohms
12	V(-)	Voltage Output Negative	
13	I (-)	Current Loop Return	
SHELL	CH.GND	Chassis Ground	Cable Shield

Fine Adjustment of Analogue Outputs

The analogue outputs from either the combo card or Analogue Output card are factory calibrated and can be used directly as shipped. However in some applications it is necessary to fine tune the output to achieve maximum performance.

From the (AnALOG) group select the (CAL.Lo) and (CAL.Hi) items to calibrate the low(0V or 4mA) and high outputs(10V or 20mA) respectively.

Calibrate the low output first followed by the high output. Use the (Frc.Anl) item to force the output Lo and Hi as a final check.

The fine adjustment procedure is carried out as follows:

- Use an external instrument to measure the analogue output.
- Select (CAL.Lo) or (CAL.Hi) from the (AnALOG) group by pressing **[SELECT ITEM]**.
- Press the **[SELECT CHANGE]** key to start the fine adjustment and switch between **“uP”** and **“dn”** to either increase or decrease the analogue output.
- Press the **[CHANGE]** key to make the adjustment. The analogue output is increased (“up”) or decreased (“dn”) every time the **[CHANGE]** key is pressed. For large changes hold the **[CHANGE]** key down and it will repeat at about 10 times per second.
- Press the **[SELECT ITEM]** key to save the changes and return to the menu.

12.5. Software Options

Serial Communications, Setpoint Batching, Extended Setpoint Batching and Modbus Network Support are optional extras with the **5100**. The standard unit does not have these options enabled. To enable any of these options it is necessary to purchase a software option code which may be entered into the instrument by the factory at the time of purchase or it may be entered via the setup menus at any time thereafter.

In this way the **5100** can be purchased at very competitive prices without paying for options that are not needed and if at a later date the options are required, the upgrade can be made on site without the need to return the unit to the factory.

The software option codes are unique to each instrument. To purchase a software option code for an existing instrument the serial number (see sticker on rear of the instrument) must be obtained.

When the **5100** is first turned on the software options installed are displayed following **"CONFIG"**.

Following is the procedure to enter a software option code into the **5100**:

Enter the **SET** & **Function** keys together for 2 seconds.

The current licensing options available are displayed and you will be prompted to enter the 6 digit Software option code.
Use the numeric keys to enter the code.
Press **<OK>** when done.
Continue entering all of the codes that you have and then press **<OK>** again to exit.

Software Option	Display at start	Features
Serial Communications	"Serial"	Needed to enable the use of Ser1 or Ser2 for printing, remote display driving, networking etc.
Intelligent Setpointing	"Setpnt"	Full batching capabilities for up to 6 materials.
Modbus Communications	"Modbus"	Enables the use of the Modbus ASCII network protocol. Requires the Serial Communications option as well.
Extended Setpointing	"Full.SP"	Extends batching capabilities to enable up to 20 different materials along with the Total Setpoint batching option. This option requires the Intelligent Setpointing Option as well. This option is also required along with the Serial Communications option to drive the PLC based output modules.

13. Error Messages

A number of error messages may be displayed to warn of operation outside of acceptable limits. These messages are given below. Short messages (xxxxx) will appear as a single message on the display. Longer messages (xxxxx)(yyyyy) will appear on the display in two parts, first the (xxxxx) part, then the (yyyyy) part.

13.1. WEIGHING ERRORS

These messages show status messages or errors that have occurred during the normal weighing operation.

(U-----)	The weight is below the minimum allowable weight reading.
(O-----)	The weight is above the maximum allowable weight reading. Warning - overloading may damage mechanical scale elements. (Check the condition of loadcell connections. Check for damaged load cell.)
(ZERO) (ERROR)	The weight reading is beyond the limit set for Zero operation. The operation of the ZERO button is limited in the setup during installation. Zero cannot be done at this weight. (Use TARE instead.)
(STABLE)(ERROR)	Scale motion has prevented a Zero, Tare or Print operation from occurring on command. (Try the operation again once the scale is stable.)
(PRINT) (ERROR)	A printer problem has prevented the printout from being completed. (Look for loss of printer power, no paper or cable fault.)
(QA)(DUE)	The “calibration due” date has been set and the current date exceeds this limit. Press any key to clear the warning for 1 hour. To clear the warning permanently, recalibrate the instrument and set a new ‘calibration due’ date. See Section 7.9 p 36.

13.2. SETUP ERRORS

These messages warn of setup entries that are not acceptable to the **5100** programme.

(RES) (LO)	The scale build is configured for less than 100 graduations. (Check the resolution (count-by) and Capacity settings)
(RES) (HIGH)	The scale build is configured for more than 100,000 graduations. (Check the resolution (count-by) and Capacity settings)

13.3. CALIBRATION ERRORS

These messages warn of incorrect calibration technique, or of attempts to calibrate the **5100** beyond it’s specification.

(ZERO) (HI)	The load cell output is beyond allowable zero calibration range. (Check for incorrect scale connection. Reduce the dead load, or shunt the load cells.)
(ZERO) (LO)	The load cell output is below allowable zero calibration range. (Check for incorrect scale connection. Increase the dead load, or shunt the load cells.)
(SPAN) (LO)	The load cell signal range (span) is too small for these settings. (Incorrect span weight entered. Scale wiring incorrect. Wrong load cell capacity [too large]. Wrong or no calibration weight added to scale.)

(SPAN) (HI)	The load cell signal range (span) is too large for these settings. (Incorrect span weight entered. Scale wiring incorrect. Load cell capacity too small for application.)
(NO) (ZERO)	There is no valid zero calibration so the span calibration cannot proceed.

13.4. DIAGNOSTIC ERRORS

The **5100** continually monitors the condition of the internal circuits. Any faults or out-of-tolerance conditions are shown on the display as an E type error message. In the table below the following terms are used:

- (check) = this item can be checked on site by service personnel
- (service) = the **5100** must be returned for factory service

(E 0001)	The power supply voltage is too low. (check supply)
(E 0002)	The power supply voltage is too high. (check scale / cables)
(E 0004)	The load cell excitation voltage is too low. (check scale/supply)
(E 0008)	The load cell excitation voltage is too high. (check scale/supply)
(E 0010)	The temperature is outside of allowable limits. (check location)
(E 0020)	Scale build is incorrect. The number of graduations has been set < 100 or greater than 100000. (fix up scale build)
(E 0040)	The positive sense line is not connected. (check connection)
(E 0080)	The negative sense line is not connected. (check connection)
(E 00C0)	Neither sense line is connected (check connection)
(E 0100)	The digital setup information has been lost. (re-enter setup)
(E 0200)	The calibration information has been lost. (re-calibrate)
(E 0300)	All setup information has been lost (enter setup and calibrate)
(E 0400)	The factory information has been lost. (service)
(E 0800)	The EEPROM memory storage chip has failed (service)
(E 2000)	The Clock Calendar chip has failed (service)
(E 4000)	The battery backed RAM has lost data.
(E 8000)	The EPROM memory storage chip has failed (service)

The “E” type error messages are additive. For example if a condition is detected where the power supply voltage is low, resulting in a reduction of excitation voltage, the resulting Error messages will be E 0005 (0001 + 0004). The numbers add in hexadecimal as follows:-

1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - A - B - C - D - E - F (For example, 2 + 4 = 6, or 4 + 8 = C)

14. SETUP MENU QUICK REFERENCE

(BUILD) SCALE BUILD Sect 7.2 p 22

- **(TYPE)** Display Type
- **(DP)** Decimal Point Position
- **(CAP 1)** Max1 capacity (lower range)
- **(E1)** Resolution (lower range)
- **(CAP 2)** Max2 Capacity (upper range)
- **(E2)** Resolution of upper range
- **(UNITS)** Units of Measure

(OPTION) SCALE OPTIONS Sect 7.3 p 23

- **(USE)** Scale Use
- **(FILTER)** Reading average
- **(JITTER)** Anti jitter weight stabilization
- **(MOTION)** Motion Detection
- **(AUTO.Z)** Auto-Zero on Startup
- **(Z.TRAC)** Zero Tracking sensitivity
- **(Z.RANGE)** Allowable Zero Operating Range
- **(Z.BAND)** Zero Dead Band

(CAL) SCALE CALIBRATION Sect 7.4 p 26

- **(ZERO)** Zero calibration
- **(SPAN)** Span calibration
- **(ED.LIN)** Edit Linearisation points
- **(Clr.LIN)** Clear Linearisation points
- **(FAC.CAL)** Restore Factory Default Calibration

(SPEC) SPECIAL SETTINGS MENU Sect 7.5 p 26

- **(PASSCD)** Passcodes and operator access
- **(BUTTON)** Locks or unlocks operating buttons
- **(FUNCTION)** Function Key and remote key setup
- **(ID.TYPE)** Recipe Id type
- **(B.LIGHT)** Backlight options
- **(AUX.DSP)** Auxiliary display options
- **(SyNC)** A/D synchronization frequency

(SERIAL) COMMUNICATIONS OPTIONS Sect 7.6 p 28

- **(SER.1)** Serial Output 1
- **(SeR.2)** Serial Output 2
- **(NET.OPt)** Network Options
- **(AUTO.OPT)** Automatic Output Options
- **(PRN.OPT)** Printing Options
- **(BAUD)** Baud Rate
- **(BITS)** Bitmap pattern, Termination etc

(SeT.PTS) SET POINTS Sect 7.7 p 33

- **(PRE.CON)** Preconfigure
- **(LABELS)** Material Names
- **(SET.TYP)** Setpoint Type
- **(SET.OPT)** Setpoint Options
- **(GEN.OPT)** General Batching Options
- **(DELAY)** Batching delays
- **(JOG)** Jogging Options

(ANALOG) ANALOGUE SETTING Sect 7.8 p 35

- **(SRC)** Select source (Gross, Net etc)
- **(Type)** Select Output Type (Volt or Current)
- **(CAL.Lo)** Fine Calibration of Low Output
- **(CAL.Hi)** Fine Calibration of High Output
- **(Frc.Anl)** Force Analogue Output for test

(CLOC) CLOCK SETTING Sect 7.9 p 36

- **(TIME)** Time set
- **(DATE)** Date set
- **(QA.OPT)** "QA Due" Option
- **(QA.DATE)** "QA Due" Date

(TEST) SPECIAL TEST FUNCTIONS Sect 7.10 p 37

- **(SCALE)** Scale base test display
- **(Hi.res)** High resolution display
- **(Frc.Out)** Force the Digital outputs
- **(tSt.InP)** Test the Digital Inputs

(FACTRY) FACTORY SETTINGS Sect 7.11 p 37

- **(DEfLt)** Restore Factory default
- **(FAC.RSt)** Factory reset
- **(ConFiG)** Software option access code entry

(-End-) Leaving Setup Sect 7.12 p 38

Notes:

Notes:

SMART WEIGHING SOLUTIONS